

APPENDIX

APPENDIX

1. *Opportunities for Wildlife Habitat Enhancement at the Industrial Excess Landfill, Wildlife Habitat Council (WHC), May 31, 2000.*
2. *Applied Natural Sciences, Inc. Agronomic Investigation, Industrial Excess Landfill at Uniontown, OH, August 2000.*
3. Copy of Appendix F. of the *Summary Report on the March 2003 Groundwater Sampling Event at the Industrial Excess landfill (IEL) Site, Uniontown, Ohio, Sharp and Associates, Inc.*, June 2003. This attachment summarizes the results of detections of volatile organic hydrocarbons from historic sampling of the monitoring well network. Results date to 1988. Includes supplemental VOC detections.
4. Site Photos (annotated) from the July 31, 2003, and the August 15, 2003, site visits by SHARP
5. Contingency Plan
6. Draft Explosive Gas Investigation for the Eastern Facility Boundary
7. IEL Draft Remedy Construction Specification
8. Reclamation Master Plan (CAG Plan)

**OPPORTUNITIES FOR WILDLIFE
HABITAT ENHANCEMENT AT
THE INDUSTRIAL EXCESS LANDFILL**

REPORT SUBMITTED TO:

**Industrial Excess Landfill Responding Parties:
Goodyear, Bridgestone/Firestone, BF Goodrich, Gen Corp
Uniontown, Ohio**

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May 31, 2000

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The Wildlife Habitat Council (WHC) acknowledges the dedication and commitment required for the Industrial Excess Landfill Responding Parties to initiate a wildlife habitat enhancement program. We thank Rick Laubacher, Donna Jennings, and Paul Wolford for their hospitality during the WHC visit.

Note: This report is intended as a guidance tool for implementing wildlife habitat enhancement programs on corporate sites worldwide. WHC cannot assume responsibility for all local, state, and federal regulatory programs and authorizations. Prior to implementing any activity in a regulated habitat (i.e., wetland, floodplain, forest), we recommend that you reference regulatory requirements in your region. WHC can assist you with the identification of appropriate regulatory contacts.

Nondisclosure Statement: This document contains confidential and proprietary information. WHC will not distribute this report to others without express written consent from Industrial Excess Landfill Responding Parties. We also recommend that discretion be used when distributing this document to others.

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I. EXECUTIVE SUMMARY

The Industrial Excess Landfill Responding Parties are collaborating with the Wildlife Habitat Council (WHC) to pursue a voluntary wildlife habitat enhancement program at the Industrial Excess Landfill (IEL) in Uniontown, OH. Goodyear Tire & Rubber Company and Bridgestone/Firestone, two of the IEL Responding Parties, are corporate members of WHC working to demonstrate that corporations are good land stewards and can manage closed sites, buffers and unused portions of their property for wildlife. Sites involving employees and/or community groups in the program exemplify the principles of WHC's Wildlife at Work program that contains, a comprehensive process for creating long-lasting benefits for wildlife and the people implementing the program. Although IEL has no employees on site, the process of involving IEL Responding Parties' employees and community groups in the development and implementation is still very valid.

This report, *Opportunities for Wildlife Habitat Enhancement at the Industrial Excess Landfill*, details a menu of potential habitat enhancement projects for the IEL Responding Parties to implement. These recommendations include not only habitat enhancement projects but also projects for involving community groups and government agencies in the program. The recommendations in this report are meant to provide the IEL Responding Parties with an optimal amount of work to maintain the program for three to five years. Initial projects focus on high visibility, ease of implementation, and likelihood of success. Once IEL Responding Parties become comfortable with the basic concepts of habitat and wildlife management, more complex projects can be recommended. Habitat enhancement recommendations outlined in this report include the following.

- Creating a nest monitoring program for bluebirds, tree swallows, and American kestrels throughout the property.
- Providing nectar sources by creating a wildflower meadow and hummingbird garden on the landfill and the surrounding area.
- Implementing a field border management program that includes a rotational mowing program, enhancing the hedgerow, and planting forested islands that will provide more diversified habitat types on the landfill.
- Promoting a balanced predator-prey relationship by building brush piles and placing raptor perch posts around the landfills.
- Providing a fox den to encourage survival of foxes on the landfill.
- Installing bat boxes to control mosquito populations.
- Control invasive species that take over and keep native vegetation from growing.

In addition to the habitat and community outreach projects, specific information about attaining recognition through WHC's Corporate Wildlife Habitat Certification/International Accreditation program is provided. Corporate sites that implement successful habitat enhancement programs on their property are eligible to receive recognition for their efforts once projects have been implemented and documented for a minimum of one year.

WHC looks forward to assisting the IEL responding parties in their effort to provide habitat for wildlife at the IEL. The opportunity to create programs with long-lasting benefits is real, and we encourage the IEL Responding Parties to use this report to make these programs successful.

II. OVERVIEW

In order to recommend wildlife enhancement projects that are appropriate to each site, the Wildlife Habitat Council (WHC) requires a site visit by one of their wildlife biologists. During this visit, the biologist assesses the site and the wildlife present, speaks with personnel to determine the goals that the site would like to accomplish and makes suggestions for habitat enhancement projects. The following is an overview of the proceedings of the visit, a description of the site itself and the flora and fauna noted during the visit.

A. Site Visit

WHC wildlife biologist, Marcia Maslonek visited the Industrial Excess Landfill (IEL) on May 19, 2000. The purpose of the visit was to assess potential habitat enhancement opportunities at the IEL site located in Uniontown, OH.

The visit began with a meeting attended by Rick Laubacher, project manager from Goodyear, Donna Jennings, manager of Corporate Issues from Goodyear, Paul Wolford, public relations from Wolford Communications, Sue Ruley, president of Lake Township Trustees, and Carolyn Casey, administrative assistant of Lake Township Trustees. During the meeting, Marcia discussed WHC and the Wildlife at Work program, as well as the benefits of managing IEL for wildlife verses utilizing a cap.

IEL is a Superfund site that has been a significant community issue for decades, and the EPA is now proposing to cap the site. The IEL Responding Parties would like to consider the alternative of managing the landfill as a greenspace instead. During the meeting, Mr. Laubacher and Ms. Ruley discussed the safety of IEL and community concerns. Ms. Ruley agreed that managing IEL for wildlife would be a win-win situation

for all, and would prevent an eyesore that would continue to remind the community of the past. Since the site is already succeeding to forest, Ms. Ruley also agreed that capping would destroy an important area for wildlife, especially with the new development the township is currently experiencing. Township concerns about any future development on site may also be alleviated with the greenspace option.

B. Site Description

Located in Uniontown OH, south of Akron, IEL is a Superfund site immediately surrounded by residential homes and a farm. The site consists of 40 fenced acres, of which 30 comprises the landfill. The site was covered in 1980 with sandy, poor soils. The fence line has grown into a hedgerow with large trees such as silver maples and black cherry and a border of shrubs and other vegetation, which is very valuable to many wildlife species. The interior is covered with cool-season grasses and large big-toothed aspen (poplar) dominate the center. Metzger's Ditch lies on the eastern side along the fence. Although narrow and shallow, this wetland is important for wildlife, as evidenced by the green frogs and painted turtle seen in the "lagoon."

C. Representation of Wildlife on Site

A number of wildlife species were observed during WHC's visit to the landfill or noted by IEL Responding Parties and the community as occurring at the site. The landfill and surrounding properties support a number of habitat requirements of species common to this area. Table 1 offers a small representation of the wildlife that was observed on site.

Table 1. Wildlife Noted During the WHC Visit

Type	Common Name	Scientific Name
Plants	box elder	<i>Acer negundo</i>
	silver maple	<i>Acer saccharinum</i>
	milkweed	<i>Asclepias syriaca</i>
	field mustard	<i>Brassica rapa</i>
	teasel	<i>Dipsacus sylvestris</i>
	horsetail	<i>Equisetum fistulosum</i>
	green ash	<i>Fraxinus pennsylvanica</i>
	English ivy	<i>Hedera helix</i>
	rush	<i>Juncaceae Family</i>
	Eastern red cedar	<i>Juniperus virginiana</i>
	apple	<i>Malus sylvestris</i>
	Autumn olive	<i>Oleaceae Family</i>
	switch grass	<i>Panicum virgatum</i>
	Phragmites	<i>Phragmites communis</i>
	phlox	<i>Polemoniaceae Family</i>
	big-toothed aspen (poplar)	<i>Populus grandidentata</i>
	black cherry	<i>Prunus serotina</i>
	scrub oak	<i>Quercus ilicifolia</i>
	staghorn sumac	<i>Rhus typhina</i>
	common locust	<i>Robinia pseudoacacia</i>
	raspberry	<i>Rubus occidentalis</i>
	black willow	<i>Salix nigra</i>
	little bluestem	<i>Schizachyrium scoparium</i>
	poison ivy	<i>Toxicodendron pubescens</i>
	red clover	<i>Trifolium pratense</i>
	rock elm	<i>Ulmus thomasi</i>
Birds	red tailed hawk	<i>Buteo jamaicensis</i>
	cardinal	<i>Cardinalis cardinalis</i>
	turkey vulture	<i>Cathartes aura</i>
	chimney swift	<i>Chaetura pelagica</i>
	American crow	<i>Corvus brachyrhynchos</i>
	gray catbird	<i>Dumetella carolinensis</i>
	northern oriole	<i>Icterus galbula</i>
	American robin	<i>Turdus migratorius</i>
Reptile	painted turtle	<i>Chrysemys picta</i>
Mammal	white-tailed deer	<i>Odocoileus virginianus</i>
	muskrat	<i>Ondatra zibethica</i>
	red fox	<i>Vulpes fulva</i>
Amphibian	green frog	<i>Rana clamitans</i>

Wildlife Noted During the WHC Visit Continued

Insects	bumblebee	<i>Apidae Family</i>
	Spring azure butterfly	<i>Celastrina argiolus</i>
	clouded sulphur butterfly	<i>Colias philodice</i>
	mosquito	<i>Culicidae Family</i>
	field cricket	<i>Gryllidae Family</i>
	European cabbage butterfly	<i>Pieris rapae</i>

Because common names of plants and animals can vary from region to region, a list of all species mentioned in this report, alphabetically by scientific name, is included in Appendix B.

Figure 1. Industrial Excess Landfill



III. DEVELOP A COMPREHENSIVE HABITAT ENHANCEMENT PROGRAM

For IEL to develop a successful wildlife enhancement program a volunteer wildlife team should be formed, an inventory conducted, and a Wildlife Management Plan developed. Since IEL does not have any employees at the site, WHC highly encourages that the IEL Responding Parties involve the community in the majority of the projects. WHC will also be available to assist when needed. When an IEL wildlife team is established, WHC recommends that the site purchase a Team Kit which contains volunteer recruitment tools, outreach ideas, guidance on writing a wildlife management plan and information about WHC's programs such as the Corporate Wildlife Habitat Certification/International Accreditation Program. A Team Kit will give ideas on how to further enhance the IEL Wildlife Enhancement program.

A. Form a Volunteer Wildlife Team

Since IEL does not have an employee base at the site, Mr. Laubacher may be one of only a few employees that will have direct involvement in the project. Therefore the team could consist of Mr. Laubacher, other interested employees, Ms. Ruley or other township trustees, and a variety of community groups and residents. A team in the form of a steering committee is recommended for IEL to expand interest in the habitat management program and ensure that a variety of interests are presented in the management plan.

WHC staff recommends that the team be structured with one team leader, who will be in charge of the overall project and smaller working groups that will deal with specific projects. Mr. Laubacher should be the team leader because he was informed of the Wildlife at Work process and is the most capable of developing the goals of the program. The team should be broken up into smaller subcommittees composed of 1-3 people who

will undertake the development of specific projects. Each subcommittee could be designated to address specific projects. WHC staff also recommends that the wildlife program consider developing a logo and a mission statement, which will give the program an identity and generate a feeling of ownership.

B. Conduct an Inventory

Once the wildlife teams are established, one of the first tasks could be to conduct an inventory of the plants and animals present at each site. The initial inventory has two important purposes. The first is to help the wildlife team become familiar with local plant and animal species. Familiarity with the wildlife at each site can stimulate enthusiasm within the interested parties and generate knowledge about individual species and their interactions. The other major purpose of the wildlife inventory is to provide baseline data for later comparison. The programs can use the baseline data to determine the success of projects and to develop new projects that will further enhance habitat. Wildlife will utilize any adequate habitats that the teams may provide, therefore as projects develop the wildlife team will hopefully witness their inventory lists grow and become more exciting.

A wildlife inventory should be a thorough and ongoing process. The goal of the inventory is to identify as many plants and animals as possible. In order to be most beneficial, inventories should be done once each season, which insures flowering plants and migratory animal species are not missed. The inventories should also be conducted at different times of the day including a night inventory to record nocturnal species such as owls and singing frogs.

WHC recommends that community volunteers and any employees that may be involved undertake the majority of the projects themselves. Outside experts assisting should understand the importance of providing educational experiences to wildlife team volunteers that are new to wildlife identification concepts. WHC is available to conduct or assist with inventories as well.

C. Write the Wildlife Management Plan

One of the most important tasks for each program is to prepare a wildlife management plan. This plan outlines the goals of the wildlife habitat program, describes projects that will achieve these goals, makes provisions for monitoring projects and presents an implementation and review schedule. Although the overarching goal of the wildlife habitat program is to enhance wildlife habitat at each site, the IEL Responding Parties may have other, more specific goals for the programs such as achieving WHC certification or enhancing community relations. WHC recommends that each of these goals, as well as all projects associated with each goal, be included in the wildlife management plans.

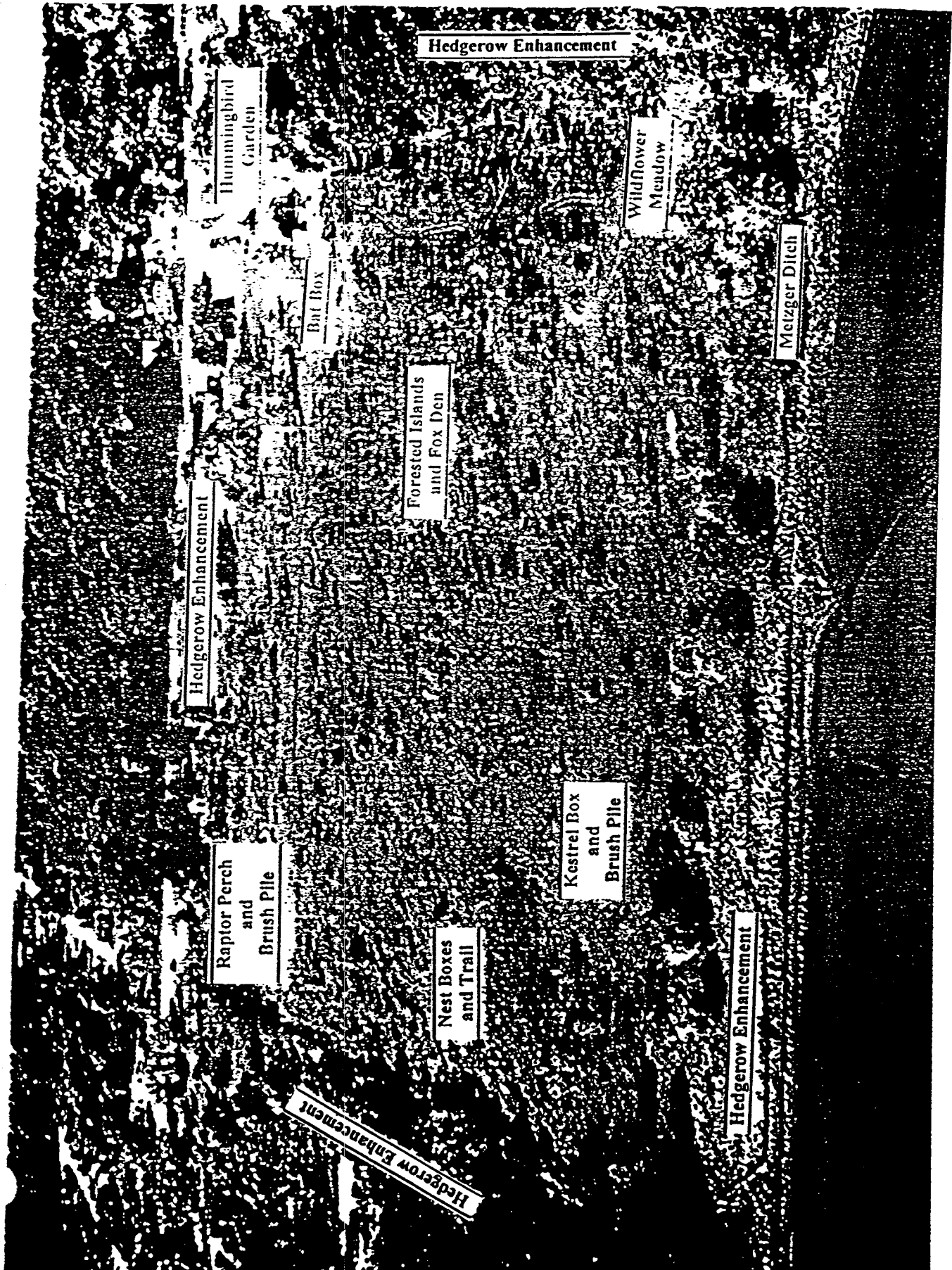
D. Implement the First Team Project

Implementing the first team project is especially important for building a solid volunteer program. Simple projects with high visibility are ideal first projects for the wildlife teams. Simplicity yields quick and measurable results while visibility generates enthusiasm and community recognition. The first year of the program at IEL may be geared towards projects that provide learning experiences for volunteers, generate additional enthusiasm and volunteers, and demonstrate to the community that the IEL Responding parties are committed to enhancing wildlife habitat at their landfills. Although enhancing habitat is a primary goal, WHC recommends the more complex, intensive habitat management projects be implemented after the teams gain experience and greater support from management and the community. Page 42 of this Opportunities Report contains a suggested implementation schedule for projects.

IV. RECOMMENDED HABITAT ENHANCEMENT PROJECTS

WHC has provided a number of habitat enhancement recommendations in this report. These projects were chosen based upon ease of implementation, high visibility and relative likelihood of success. Projects recommended for the landfill include artificial nesting structures, a fox den, wildflower meadow, bat box, field border management, hummingbird garden, management for raptors, control of invasive species and wildlife monitoring. Some projects recommended might even reduce ground maintenance time. The program at IEL could have considerable positive impact on local wildlife habitats. Figure 2 is a map of recommended enhancement project locations in IEL. The concepts presented in this report can be used to develop a site map once the program begins and specific opportunities are recognized.

Figure 2. Enhancement Projects at the Industrial Excess Landfill.



A. Install Nesting Structures for Cavity Nesting Birds

The landfill will provide the needed habitat components for a number of cavity nesting bird species that are likely to use the site. To build upon the preferred open space habitat component for eastern bluebird, tree swallow and American kestrel, WHC recommends the creation of a nest-monitoring program for the IEL site. Nest monitoring programs are fun, highly successful and provide active management at an otherwise dormant site.

1. Begin a Nest Monitoring Program

Like other projects, monitoring and maintenance of nesting structures is critical for program success. Nesting boxes for songbirds should be checked weekly during the nesting season. Data should be recorded on the species, number of eggs, chicks and, in the future, the number of fledglings. This data can be sent to WHC at the conclusion of the nesting season for submission in the Nest Monitoring Program. Additional information on registering for this program, as well as sample monitoring data sheets, can be found in Appendix F.

Monitoring weekly during the nesting season will help volunteers identify threats to the success of the project such as wasps, ants, and other parasites that may invade the box. Team members should also identify the user of the nest box to ensure that the species using the box are not European starlings or English house sparrows. These two species are not native to North America, and compete with native bluebirds and other cavity nesters for nesting habitat. These aggressive competitors have been known to invade a nest occupied by native birds and even kill the adult to obtain access to and use of the nesting cavity. Starlings and house sparrows and their eggs should be removed from the nesting box, and (if the team members feel comfortable) destroyed in the effort to counteract the effects of these birds on bluebird populations. Removing the nests of these species before eggs are laid or young hatch may be referable for some members of the team, and addresses the problem more quickly. Monitors should positively identify nest occupants as European starlings or house sparrows before any bird is disturbed, as these two species are the only two cavity nesters not protected by federal law.

In addition to weekly monitoring, the wildlife team should remove nests once young have fledged to prevent parasite problems, and clean boxes at the conclusion of the nesting season in preparation for the following season. Damaged boxes should be repaired or replaced. Nesting boxes that were unsuccessful for more than two consecutive years should be relocated to more suitable locations. Nesting boxes should not be removed for the winter, as some species of birds and small mammals will use the box as protective cover during winter months.

2. Eastern Bluebird

Eastern bluebirds have suffered greatly due to habitat degradation, the widespread removal of dead standing trees, and the systematic removal of hedgerows once common in farmlands across the eastern United States. Efforts to restore bluebird nesting habitat via the placement of artificial nesting boxes throughout the nation have been successful, and WHC recommends that wildlife team volunteers contribute to this effort by placing nest boxes at the IEL site. This project is also of great educational value, because boxes are simple to construct and provide team members the opportunity for viewing wildlife up close.

Bluebirds inhabit open fields, pastures, and rights-of-way with scattered trees and shrubs that serve as perching sites. Nests are built in tree cavities, or in artificial cavities provided by humans. Their diet consists of insects, which are spotted by perching bluebirds and captured in mid-flight. In winter when insects are scarce, bluebird diets shift to include berries and seeds. They are gregarious birds, and are often seen in flocks of ten or more, sometimes mixed with juncos and cedar waxwings. To provide nesting sites at the IEL site, WHC recommends placing nesting boxes along a trail in the grassy, open areas along the path. To improve success of the bluebird nesting structures, weekly monitoring is required.

Nesting boxes for eastern bluebirds can be built using various designs, however, some designs tend to be more successful than others. WHC recommends the design provided

in the Eastern Bluebird Habitat Management Leaflet in Appendix F because of its proven success. The box should be built from weather-resistant cedar.

Nesting boxes should be erected along hedgerows or in open fields near a tree that can serve as a hunting perch and a location for fledging chicks to fly to on their first flight. Boxes should be placed on a pole with a predator guard affixed below the nesting box. Boxes placed on trees instead of poles tend to be less successful because of the accessibility by predators from both below and above. A predator guard is an umbrella shaped piece of metal that is attached to the pole and disallows predators such as raccoons and black snakes from accessing the box easily. Designs for predator guards are found in the *Eastern Bluebird Habitat Management Series* in Appendix F.

WHC recommends that the IEL wildlife team involve local community organizations, schools, and scouts in the construction, upkeep, and monitoring of the nesting structures. The Ohio Bluebird Society should be contacted for information and involvement in advancing this program. WHC also recommends that the trail be registered with the North American Bluebird Society's Transcontinental Bluebird Trail. The wildlife team could also attract volunteers by posting invitations and updates on the IEL community newsletter. Contact information for different organizations is found in Appendix C.

3. Tree Swallow

Tree swallows are another species that commonly use nest boxes placed in open areas. They are attracted to open areas and water sources and will commonly be seen feeding on insects close to the water's surface. The lack of suitable nesting sites is a limiting factor in the success of the tree swallow's reproduction. Tree Swallows will use the same box design as the bluebirds. WHC recommends placing tree swallow nesting structures near the Metzger's Ditch where the birds will help in insect control. Paired boxes can be successful in attracting both target species since bluebirds and tree swallows are only territorial within their respective species. Similar care should be taken when monitoring these boxes as snakes, raccoons, European starlings and English sparrows are also common predators or competitors of the tree swallow. Additional information about

managing for tree swallows is included in the *Tree Swallow Habitat Management Series* located in Appendix F.

4. American Kestrel

The American kestrel feeds on mice, lizards and large insects such as grasshoppers and crickets. The kestrel typically builds its nests in cavities created by flickers or pileated woodpeckers. However, such cavities are in short supply, and kestrels can be attracted to nest boxes.

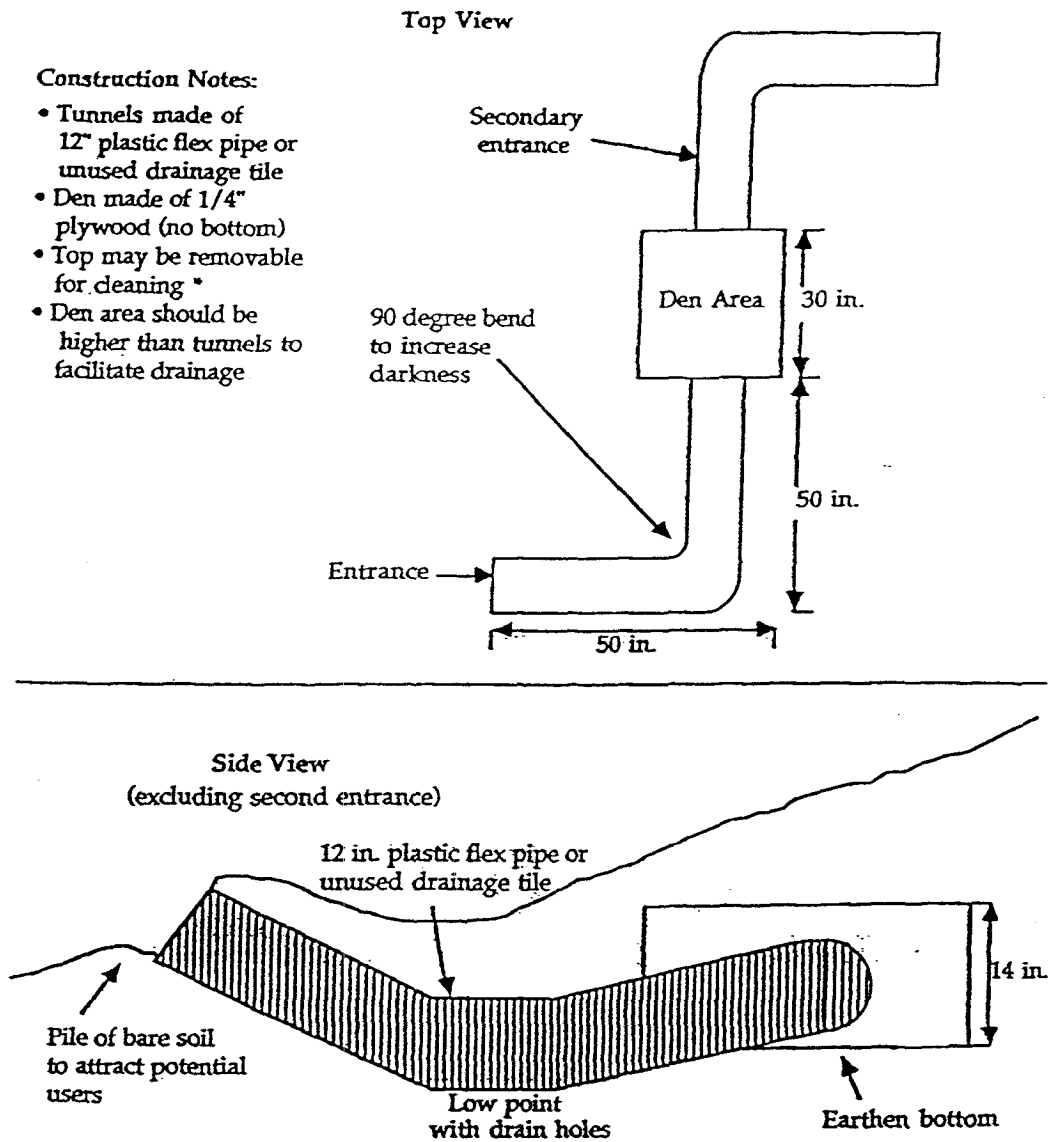
Monitoring of nest boxes is to be done from afar since American kestrels are sensitive to human disturbance during their nesting cycle. Nest boxes should not be opened or disturbed to observe nests and young. If kestrels are observed bringing nesting material to the box, it can be assumed that they are building a nest. Once the young have hatched, kestrels can be observed flying to the box with food throughout the day. WHC recommends that nesting boxes for kestrels be placed in open areas, near brush or forest edge for food, and near a lookout perch (refer to Section F). Care should be taken to place boxes in open areas, but not too near songbird boxes as kestrels will occasionally feed on small birds as well as insects and small mammals. Additional information on kestrel management is available in the *American Kestrel Habitat Management Series* in Appendix F.

B. Artificial Fox Den

Red foxes are primarily carnivorous, feeding mostly upon small birds and mammals such as mice and rabbits, but will also eat berries and nuts when the opportunity arises. They primarily utilize underground dens during the breeding season (March to June) and to escape inclement weather. Dens are not typically located in areas which are heavily frequented by humans. Preferred den sites are near water sources and have at least two entrances.

The den should be installed near the center of the property or along the hedgerow area where it might be visible to visitors but still far enough to provide the foxes with plenty of privacy. Since a Fox's home range is at least 250 ha., the site will probably only support one breeding pair. However, foxes usually occupy more than one den site. To provide adequate denning habitat, two fox dens should be created on site.

Figure 3. Artificial Fox Den



- * For safety, if a removable top is installed, the den should only be opened when the den is not occupied.

A fox den can be created by constructing a 14-inch by 30-inch box out of plywood to serve as the actual den and using 12-inch plastic flexible pipe for the entrance (see Figure 3). The entire structure should be buried, but the den area should be higher than the tunnels to provide drainage. Small holes can be drilled in the floors of the den and the entrance tunnels to improve drainage as well. Vegetation can be planted around the

tunnel entrances to help stabilize the soil around the openings. Detailed instructions for constructing a fox den can be found in the Red Fox Habitat Management Series in Appendix E. The fox den should be monitored for use by observing signs of activity such as fox tracks and scrapes or remains of prey near the den entrances. The den itself should not be opened if there is a chance that there is a fox inside.

C. Wildflower Meadow

WHC recommends planting a wildflower meadow to increase the vegetative diversity and aesthetic quality to the landfill. A variety of wildlife species such as songbirds, butterflies, small mammals and other pollinators use meadow habitat. To accomplish the goal of increasing diversity, WHC recommends one-acre test plots of wildflowers to determine the species that are most likely to flourish in the soils found at the sites. The wildflower meadow should be planted in the grassy field just right of the entrance gates. This area is naturally framed by the landscape and is one of the first things people see as they come in. The wildflower meadow will make a good first impression to visitors at the site.

1. Preparing the Planting Area

The preparation and planting of the wildflower meadow is a good opportunity to initiate enthusiasm amongst the volunteer wildlife team. Careful site preparation is essential to wildflower meadow success. WHC recommends drill-seeding wildflower species into the existing vegetation. This method should be adequate for introducing additional species to the vegetative community found on the landfill. To prepare the seeding areas, WHC recommends mowing the chosen areas to a height of three inches to limit initial competition from grasses.

WHC recommends planting the meadow seed using a no-till native seed drill such as a Truax brand seed drill in May following the mowing. If preparation of the meadow does not finish before spring breaks, seeding of the meadow can occur in the fall (early

October). This may give the seed more time to settle in the soil and promote germination once the soil warms the following spring. Truax drills sow seed directly into existing vegetation without requiring disturbance of the soil. Ultimately, this reduces soil erosion and siltation into nearby water sources. Seed rates for meadow grass/forb mixtures typically range from 12 to 20 lbs./acre. It is also important to keep fluffy and heavier wildflower and grass seed separated in the proper compartments within the seeder to ensure proper dispersion of seed into the soil.

Signs could be placed in the area to label it as a wildflower management area. Without the signs, people passing by could perceive that maintenance of the area has waned especially during times when flowers are not in bloom.

2. Choosing Appropriate Seed Mixes

A list of potential wildflowers and grasses for the team to plant can be found on Table 2. Native wildflowers tend to grow more successfully in local area soils, are more beneficial to local native wildlife and tend to need less maintenance and monitoring over time. The mix should be composed of a variety of plant species. A high percentage of perennials, however, will reduce the need for continual seeding of the area year after year. Some native annuals can be added to provide color during the first and second years after planting.

Table 2. Native Plants for Wildflower Meadow

Type	Common Name	Scientific Name
Grasses	little bluestem	<i>Andropogon scoparius</i>
	broom sedge	<i>Andropogon virginicus</i>
	side-oats grama	<i>Bouteloua curtipendula</i>
	purple love grass	<i>Eragrostis spectabilis</i>
	Indian rice grass	<i>Oryzopsis hymenoides</i>
	switch grass	<i>Panicum virgatum</i>
Wildflowers	columbine	<i>Aquilegia canadensis</i>
	Verbena stricta	<i>Asclepias syriaca</i>
	butterfly weed	<i>Asclepias tuberosa</i>
	New England aster	<i>Aster novae-angliae</i>
	wild indigo	<i>Baptisia tinctoria</i>
	purple coneflower	<i>Echinacea purpurea</i>
	fireweed	<i>Epilobium angustifolium</i>
	saw-toothed sunflower	<i>Helianthus grosseserratus</i>
	thyme leaved pinweed	<i>Lechea minor</i>
	round-headed bush clover	<i>Lespedeza capitata</i>
	cardinal flower	<i>Lobelia cardinalis</i>
	wild lupine	<i>Lupinus perennis</i>
	wild bergamot	<i>Monarda fistulosa</i>
	horsemint	<i>Monarda punctata</i>
	common evening primrose	<i>Oenothera biennis</i>
	tall cinquefoil	<i>Potentilla arguta</i>
	Canada goldenrod	<i>Solidago canadensis</i>
	hoary vervain	<i>Verbena stricta</i>

Local nurseries, such as those listed in Appendix C, may have seed mixes available, but the team should closely examine the list of components of the mix in order to confirm that they are native. Invariably, some seed mixes contain annual wildflowers that will provide color during the first year of seeding. Although many of the annuals commonly used in wildflower seed mixes are not native to the state of Ohio, the wildlife team could retain one or two native annual species in the mix to provide this initial burst of color. At the time of purchase, verify with the local nursery on planting technique, as these considerations vary with the actual seed mix chosen. Experienced nursery personnel should also be able to provide seeding and seedbed preparation suggestions to supplement those recommendations outlined above.

3. Maintenance and Monitoring of the Wildflower Meadow

The team should keep in mind that although the seeds will germinate, a large amount of brightly colored flowers should not be expected during the first year of seeding (unless the annual species referenced above are included in the seed mix). Perennial wildflowers expend most of their energy during initial years of growth in root production, and relatively little energy in flower production. In future years, the flowering perennials will thrive, provided weeds surrounding the area are kept in check and climate conditions are relatively normal. During the first year of establishment it will be critical to provide favorable growing conditions. To accomplish this, WHC recommends mowing the planting area to a height of six inches from spring to fall. This will limit competition and will allow perennial wildflowers to become established while focusing energy on the development of strong root systems. After the first year, a yearly mowing or burning program could be developed.

The wildflower meadow should be mowed the second year in late winter/early spring before ground-nesting species begin nests. After the second year, half of the meadow should be mowed every year, alternating the half mowed each year. This will eliminate the impact on beneficial insects in the meadow. Further information on the preparation, planting, and maintenance of the meadow can be found in the *Meadow Management Habitat Management Series* in Appendix F

The team should record in their wildlife activity journal the relative success of each wildflower species in addition to any particular species of wildlife that is found to be using the wildflower meadow. Photo documentation is an excellent addition to a site's application for WHC certification.

D. Bat Box

Contrary to popular belief, bats are not blind and do not get tangled in people's hair. Centuries of myths and superstition have caused bats to be one of the most endangered

animals in the world and the least appreciated. Bats are extremely important to our ecosystem. In tropical areas of the world bats are one of the primary pollinators and are the chief pollinators in banana plantations. In the United States, bats help control insect populations. A single little brown myotis, one of the nation's most widespread bat species, can consume up to 600 mosquitoes per hour. In areas of large insect populations, bats reduce nuisance species dramatically.

1. Bat Boxes

Bats are the only mammals that can truly fly, and are most active at dawn and dusk. Bats are cavity nesters, often using building attics and rafters, hollow trees, and caves. They are very particular about their nesting spaces, but if proper conditions are provided, bats will nest in manmade bat boxes.

Research by Bat Conservation International shows that bats prefer boxes near open fields at least ¼ mile from water, where insect populations are high. WHC recommends that bat boxes be placed around the open area above the lagoon. The team could also place bat boxes on posts, and in trees 15-30 feet above the ground, as long as the box receives at least eight hours of full sun. The exterior can also be painted black to increase the interior temperature. Bats also prefer boxes mounted in an area free of obstacles such as brush and tree branches for 20 feet.

Bats are most likely to move into a box in an area with other boxes nearby. Once the boxes are established, bats will generally return to the same one annually. The wildlife team members can monitor bats by looking up into the boxes during the day with a flashlight to count the number of occupants. Although they are not aggressive, bats should never be handled.

If no bats occupy the boxes within the first year two years, try moving the boxes to new locations. Box height and amount of sunlight in the area can be critical. For more information about bats, and for a diagram on constructing a bat box, refer to the North American Bat Conservation Habitat Management Series in Appendix F.

2. Utilize Bat Detection Software and Equipment

Insectivorous bats use high frequency sounds (echolocation calls) to navigate and hunt their prey during the night. The echolocation sounds provide an opportunity to monitor and identify insectivorous bats. WHC recommends that the wildlife team borrow or purchase and utilize bat detection equipment such as Anabat to help learn bat species, their locations, and behavior.

Bat call identification requires specialized computer software and a set of reference calls for bat species in the state of Ohio. Bat calls are recorded and displayed on a computer screen as a pattern of dots on a graph that plots frequency vs. time graph. Different species of bats give calls with different frequencies, shapes, and timing. By distinguishing the differences in the calls, the wildlife team could determine the species of bat. Without the computer software the wildlife team may not be able to identify the species of bat, but they could still listen and monitor bats with a bat detector.

The Anabat system is comprised of a bat detector, interface module and software, as well as many accessories. The system is readily and inexpensively available to the general public. Anabat software can be downloaded from the University of New Mexico's web page at <http://talpa.unm.edu/batcall/software>. For general questions on the Anabat system contact Titley Electronics, titley@nor.com.au.

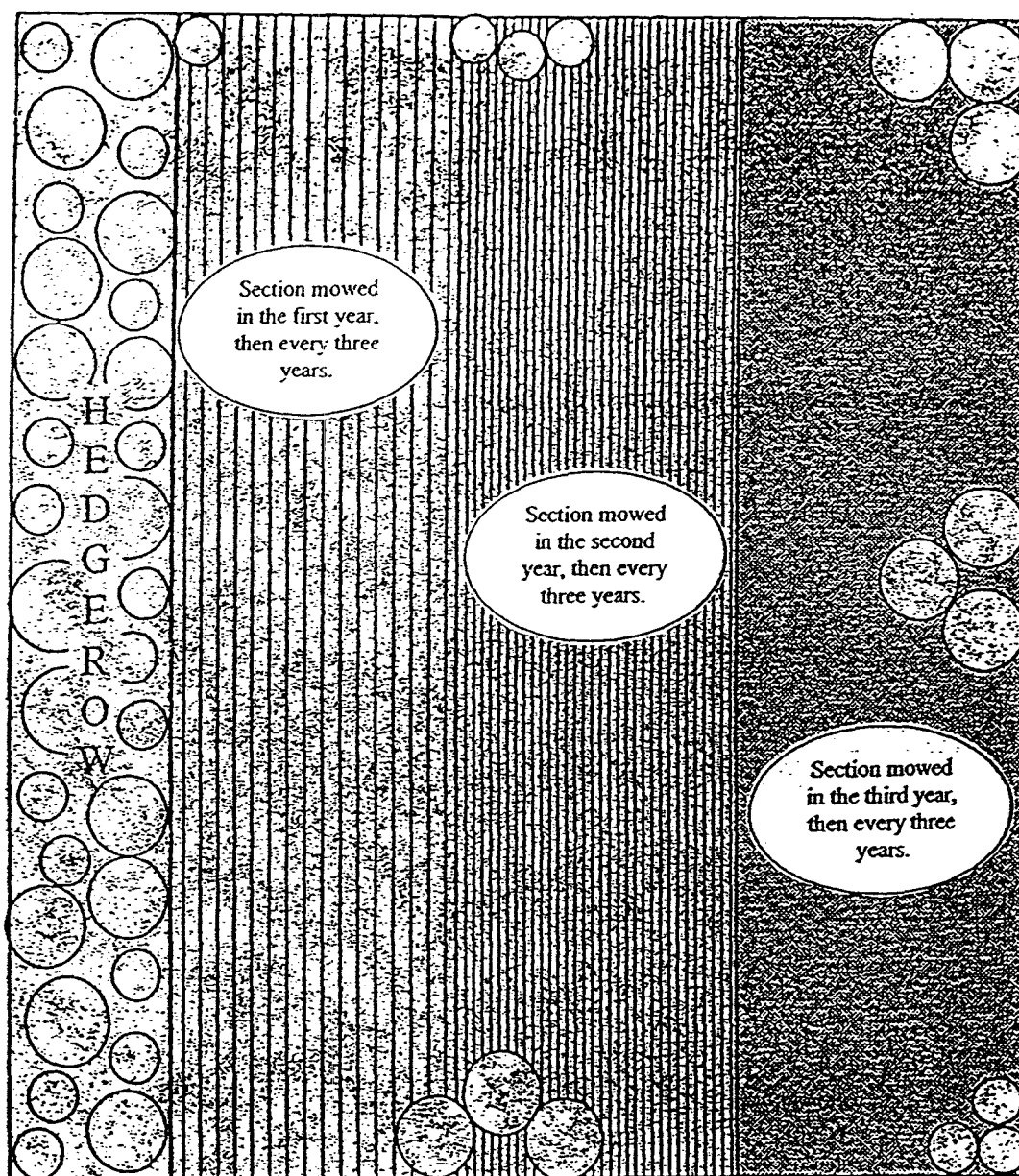
E. Field Border Management

WHC recommends that IEL be managed in a way that benefits wildlife by improving habitat. Hedgerow maintenance, vegetation islands, and rotational mowing are managing techniques that could be implemented to increase cover and food sources for wildlife.

1. Develop a Rotational Mowing Program

A rotational mowing program could be established on the wildflower meadow and the open grassy area that encircles the landfill. By implementing a rotational mowing program, money can be saved by reducing maintenance costs while providing wildlife with more suitable habitat. In addition, many of the grasses used to vegetate the landfill will be encouraged to produce seed, a food source for a variety of wildlife. Regular mowing can prevent species from achieving their optimum food and cover values. To develop a rotational mowing program, divide the area into sections that are mowed in alternate years. Figure 4 shows the layout of rotational mowing strips. Each strip is assigned a number representing the year in which that particular strip is to be mowed in. For example, strips with number one are mowed in the year 2000, number 2 strips in the year 2001, and number 3 strips in 2002. A plan should be developed that allows for no more than three years without mowing to keep woody vegetation from becoming established. Rotational mowing diversifies habitat by providing short grass areas for foraging and taller grass areas for nesting and escape cover. Mowing should not occur May-September as this is the nesting season for ground-nesting birds.

Figure 4. Rotational Mowing



2. Enhance Hedgerow

Hedgerows provide important components, such as food and cover, for many species of wildlife and are most important to wildlife when accessible as travel corridors. They are especially important to birds that prefer edge habitat, such as the catbirds noted during the site visit, because they prefer trees and shrubs near their feeding grounds. To enhance these hedgerows for wildlife even further, trees and shrubs can be planted to widen the

rows, increase the biodiversity of the site, and provide additional food sources for wildlife. A strip of switchgrass bordering the hedgerow would be an especially valuable addition, providing winter cover and seed as well as summer nesting grounds for a variety of birds, Table 3 contains a list of other species that may be used to enhance the hedgerow over time.

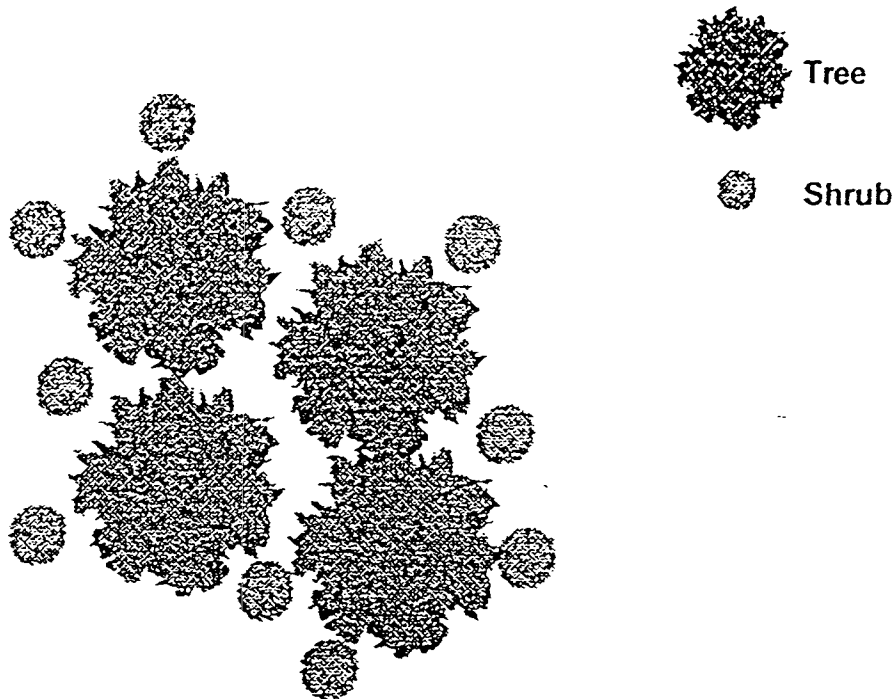
Table 3. Native Vegetation for Hedgerows and Forested Islands

Type	Common Name	Scientific Name
Grass	switch grass	<i>Panicum virgatum</i>
	needlegrass	<i>Stipa spartea</i>
	June grass	<i>Koeleria cristata</i>
Shrubs	Jerseytea	<i>Ceanothus americanus</i>
	common buttonbush	<i>Cephalanthus occidentalis</i>
	silky dogwood	<i>Cornus amomum</i>
	gray dogwood	<i>Cornus racemosa</i>
	American filbert	<i>Corylus americana</i>
	shrubby Saint John's wort	<i>Hypericum prolificum</i>
	common winterberry	<i>Ilex verticillata</i>
	common spicebush	<i>Lindera benzoin</i>
	American black currant	<i>Ribes americanum</i>
	Alleghany blackberry	<i>Rubus allegheniensis</i>
	blackcap raspberry	<i>Rubus occidentalis</i>
Trees	box elder	<i>Acer negundo</i>
	black maple	<i>Acer nigrum</i>
	red maple	<i>Acer rubrum</i>
	common pawpaw	<i>Asimina triloba</i>
	bitternut hickory	<i>Carya cordiformis</i>
	shagbark hickory	<i>Carya ovata</i>
	common hackberry	<i>Celtis occidentalis</i>
	frosted hawthorn	<i>Crataegus pruinosa</i>
	dotted hawthorn	<i>Crataegus punctata</i>
	green ash	<i>Fraxinus pennsylvanica</i>
	common witchhazel	<i>hamamelis virginiana</i>
	red mulberry	<i>Morus rubra</i>
	American plum	<i>Prunus americana</i>
	black cherry	<i>Prunus serotina</i>
	northern red oak	<i>Quercus borealus</i>
	smooth sumac	<i>Rhus glabra</i>
	staghorn sumac	<i>Rhus typhina</i>

3. Forested Islands

The center of the landfill is in the early stages of succession to a forest, as evidenced by the tall poplars dominating the area, sumac, and a few scrub oak saplings. The center can be left to succeed to a forested area while creating covered areas for shelter. Planting in this manner more closely imitates nature by providing species diversity, as well as vertical diversity, for maximum benefit to wildlife. Figure 5 illustrates what a forested island may look like. In addition to the naturally occurring species, the team may wish to supplement with planting, thereby "helping nature along." By using native species that produce fruit or hard mast (like oaks and hickories), the IEL Responding Parties can provide food and cover for wildlife while helping to protect the natural biodiversity of Ohio. Seedlings and saplings should be planted in early spring, giving them time to develop a root system and enough nutrients to carry them through the winter. WHC recommends planting the small trees and shrubs listed in Table 3 because they were chosen for their attractiveness to butterflies, birds, and other wildlife species. The nursery supplying IEL with the trees and shrubs could provide additional tips and information, particularly regarding species that will thrive on the soil conditions of IEL.

Figure 5. Forested Island



Trees should be planted 12 feet apart

Shrubs should be planted 3 feet apart

F. Hummingbird Garden

The entrance in front of the gates lends itself well to the creation of native wildflower gardens that attract and provide habitat for hummingbirds. Hummingbird gardens are ideal initial projects for a Wildlife at Work program, and WHC recommends that the wildlife team undertake this project as one of their first. The garden will serve as an invitation to the community to participate and learn about the efforts at IEL.

WHC recommends that wildflower species from table 2 be used in the hummingbird garden. Once planted, the garden will need periodic monitoring. The wildlife team should take note of which species are surviving better than others, and the species of plants visited most frequently by hummingbirds. Also, weeds that appear to be invading

the gardens should be removed once they get tall enough to confirm their identity as undesirable. A raised bed can be created for the garden to reduce the spread of grasses and other intrusive species, as well as increase visibility of the garden. Also, the garden may need supplemental watering in times of excessive drought.

The entrance gate may also be incorporated into the garden by planting native vines that will eventually climb up the fence. Vines are of great benefit to hummingbirds and other birds as they provide nesting cover and additional food sources. By having vines near the hummingbird gardens, the wildlife team is providing escape cover from predators. Table 4 lists native species of vines that may be used.

Table 4. Native Vine Species

Common Name	Scientific Name
common trumpet creeper	<i>Campis radicans</i>
American bittersweet	<i>Celastrus scandens</i>
virgin's bower	<i>Clematis virginiana</i>
common moonseed	<i>menispermum canadense</i>
Virginia creeper	<i>Parthenocissus quinquefolia</i>
common greenbrier	<i>Smilax rotundifolia</i>

WHC recommends that the wildlife team make note of their monitoring efforts in their activities journal for future reference, and for documentation necessary for WHC Certification.

G. Manage Open Areas for a Balanced Predator Prey Population

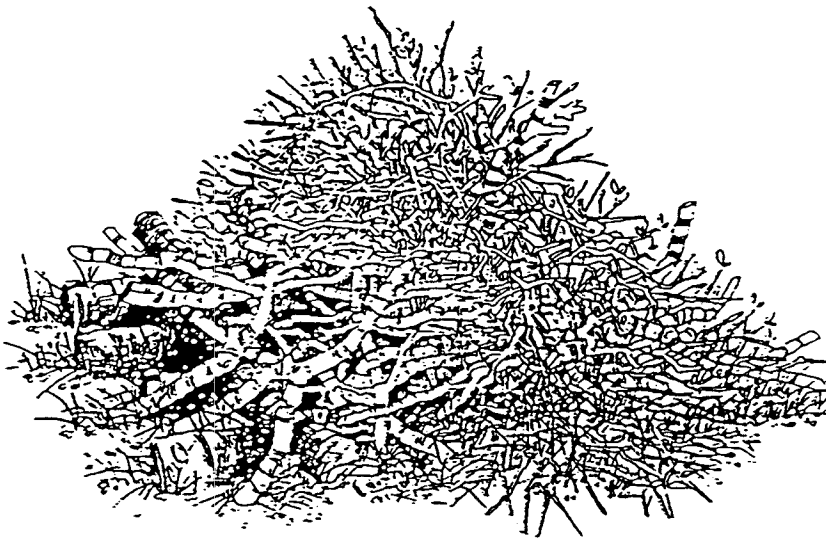
Managing for a balanced predator-prey population is important to keep a healthy ecosystem. A balanced population of predators and prey will keep vegetation from being over consumed and diseases from spreading. Predators will eat injured and weak prey keeping populations strong and healthy. To maintain this balance WHC recommends building brush piles to provide cover for prey and raptor perches to provide hunting platforms for avian predators. The wildlife team could gather information on predator prey relationships that they may observe.

1. Brush Piles

Brush piles provide essential nesting, escape and perching cover for small mammals and birds. When properly constructed and installed in appropriate locations, brush piles serve to balance interaction and population dynamics between predator and prey species. Birds nest and perch in the top branches; small mammals, especially rodents, burrow and nest in the lower parts; and insects and worms live and feed in the rich soils formed as the brush pile ages. Brush piles are dynamic habitat components, offering living and feeding options for wildlife species that are continually faced with habitat fragmentation and degradation.

Construct brush piles from cut or downed trees and twigs found around the sites. A properly constructed brush pile has two parts: a base and a top. Build the base with the largest and most weather-resistant logs available. Lay these directly on the ground or on cinder blocks to reduce weather rot. Take care to keep the lowest base logs close enough to the ground, approximately four inches off the ground, to allow passage for small mammals like rodents while discouraging foxes or coyotes. After stacking several of these layers in a log house design, construct the top of the brush pile by covering the base logs with twigs and brushy branches. WHC recommends that brush piles be built along grassy paths. Figure 5 shows a diagram of a typical brush pile. Refer to the *Brush Pile Habitat Management Series* in Appendix F for further instruction on how and where to install brush piles.

Figure 6. Brush Pile Construction



The Base

A solid base with thick branches or trunks should be created. This will extend the life of the brush pile and it will also provide cover and nesting areas for additional species.

The Crown

Smaller branches should be piled on the top making the brush pile half as tall as it is wide. This will create a brush pile that can be used by larger mammals.

Adapted from "Enhancement of Wildlife Habitats on Private Lands." Daniel J. Decker and John W. Kelly. 1968.

Constructing rock piles is another easy, beneficial way of providing security and habitat components for wildlife. They offer many of the same benefits as brush piles, and can also support different species, including reptiles, if the interior of the pile is constructed to provide a fairly stable interior climate.

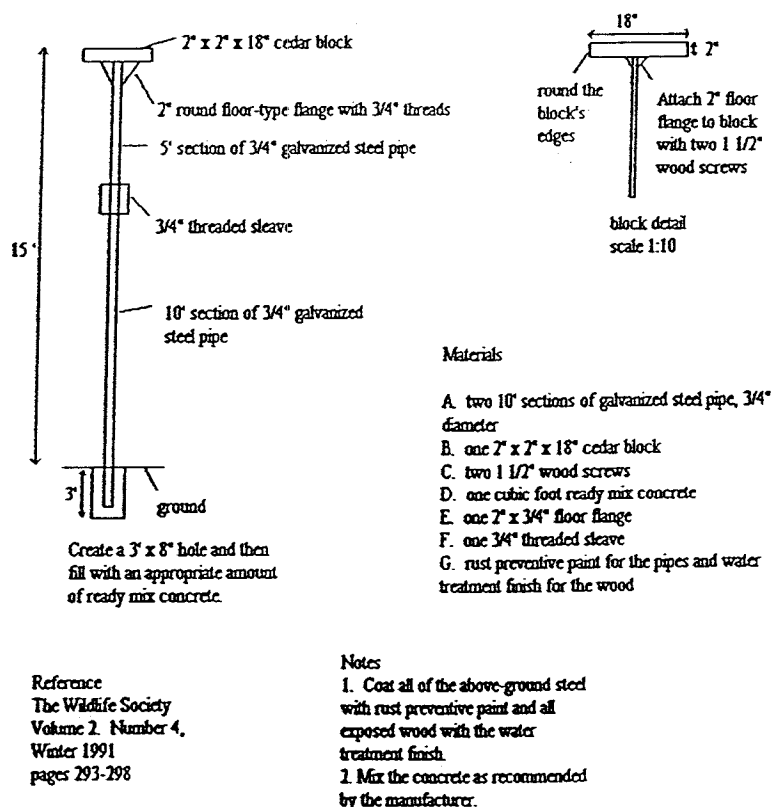
For best results, use rocks with diameters greater than 30 cm. Place the coarsest, biggest rocks along the foundation of the pile in order to create a maze of spaces within the pile. Avoid creating a perfectly symmetrical pile; the more irregular a rock pile's edges, the more wildlife diversity it will attract. For this reason, WHC recommends constructing several small, adjacent piles in place of one large one. This arrangement creates adjoining microhabitats, thus supporting more species variety.

Rock piles and brush piles are versatile in size, so the team can place them anywhere they notice a lack of natural nesting and habitat components. WHC recommends placing rock piles in open areas near the lagoon.

2. Place Raptor Perch Posts

Creating raptor perches will be one way to improve IEL for raptors such as American kestrels, red-tailed hawks, and broad-winged hawks. Raptor perches serve as management tools used to compensate for the lack of natural habitat components, such as snags and open-branched trees commonly found in or along open fields. They provide raptors with a good view of open fields, thus providing vantage points for hunting prey items, especially small mammals. Refer to Figure 6 for a diagram of a raptor perch.

Figure 7. Diagram of Raptor Perch Construction



Raptor perches serve to create a balance among the avian predators and prey typically found in more natural areas. Raptor perches are also valuable as a program component because they provide ideal locations for spotting raptors for identification. This often draws the attention of volunteers or others interested in any new management strategies on site. Raptor perches should be placed in open areas to facilitate hunting. Refer to the Raptor Perches Habitat Management Series in Appendix F for more information.

H. Control Invasive Species

Several strands of *Phragmites*, autumn olive, and sumacs were observed during the site visit. Like most invasive species, these three species are aggressive and form dense thickets that crowd out desirable native plants. Unlike the other two, the sumac is native and provides food for wildlife, but is aggressive. Control measures for this species should be undertaken to control large, dense stands that may crowd out more desirable species.

Once established, these plants are difficult to control. WHC recommends using a variety of methods. Smaller plants (with stems one inch or less in diameter) can be dug out and physically removed. The larger plants will require chemical control. For larger plants, the wildlife team can use a non-persistent glyphosphate herbicide. The herbicide should be applied carefully in accordance with the instructions on the product label. A non-persistent glyphosphate herbicide is nonselective; thus great care must be taken to reduce the possibility of damaging desirable vegetation. The herbicide can be applied directly to the foliage or to a cut stump. WHC recommends using both methods. The wildlife team should apply the herbicide to the foliage in late summer. Also, spraying in late fall after most natives have dropped their leaves will help avoid killing desirable plant species. The second method requires cutting the stems at the base and then applying herbicide to the cut stem to inhibit further growth.

V. RAISING COMMUNITY ENVIRONMENTAL AWARENESS

An important aspect of a wildlife program is the benefit it provides, through environmental education, to the community and the employees and their families. Therefore, a volunteer-driven wildlife program that approaches outside groups in the local community for assistance has great potential to educate participants about wildlife and their habitats. A program could begin with IEL Responding Parties' staff, expand to

civic groups, scouts and eventually local schools. If IEL is opened for education a nature trail, descriptive signs of different programs, and an education center could be utilized. Since the Township is still uncertain about allowing people, especially children, on site, special trips could be scheduled with the responding parties ahead of time. After these regular visits occurred as a pilot program, the site could possibly be opened to the community as a whole, or to certain groups or schools. The following sections detail recommendations to develop these relationships with the community and provide environmental education.

A. Nature Trail

A nature trail could be incorporated into the existing grassy path that goes around the landfill. Loops can be added to include the fox den and the lagoon. If these loops are going to be added careful attention should be paid to maintaining a level of privacy needed for a successful fox den and to minimize the disturbance on amphibians and reptiles that use the lagoon. The trail should parallel the bluebird boxes for educational purposes and to make monitoring easier.

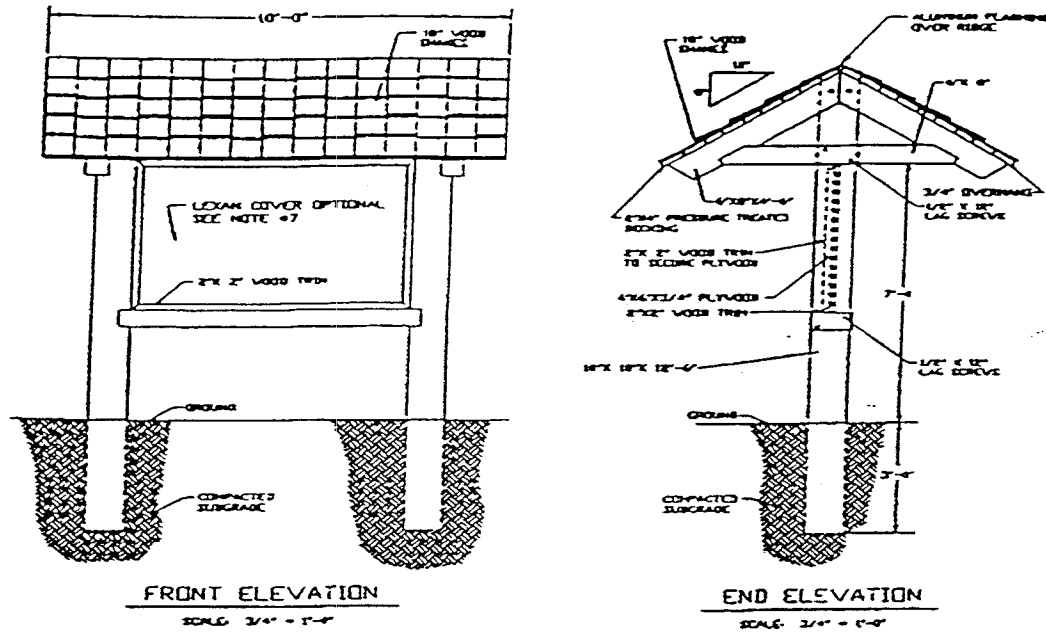
Goodyear has expressed interest in using recycled rubber as the trail surface. This is an excellent opportunity to demonstrate to the community that the IEL Responding Parties are devoted to good land stewardship and are practicing recycling and reusing of products. An interpretive sign should point out the importance of reusing and recycling and discuss the use of recycled rubber.

1. Add Interpretive Stations

Interpretive stations at certain points along the trail can be valuable educational tools. Developing these stations would also make an excellent partnership between the school or scout groups, provided that the students would be involved in their placement.

WHC recommends that the trailhead contain a kiosk or bulletin board. A kiosk (Figure 7) can serve a variety of purposes. First, it offers an opportunity to educate and communicate environmental programs and efforts to employees. A kiosk can also be used to provide information that may be essential to the enjoyment of the trail. Information on protecting the natural features of the trail is also crucial. More specifically, a kiosk could provide a trail map, trail rules, guidelines for minimizing impact on trail resources, and a species list pamphlet. Including a species checklist at the kiosk would provide visitors with a challenge to see if they could observe all of the species found on the site. People using the checklist could be asked to deposit the list in a drop-box at the end of the trail so that the data can be used to update the team's wildlife species inventory. Since people will not stand at the kiosk for long periods of time, short, concise messages using graphics are best.

Figure 8. Kiosk Design



Notes:

1. All wood should be pressure treated.
2. All hardware and nails need to be galvanized.
3. Cedar wood shakes should be approximately 18" x 1/2" with a 5 1/2" exposure.

Source: Appalachian Trail Conference. 1995. *Planning a Trailhead Bulletin Board*.

Education stations along the trail should be designed to inform visitors about the plants, wildlife, and natural features that can be seen from the vantage point of each interpretive station. Trail markers, signs, and corresponding trail guides could point out habitat projects natural features, historical sites, plants, or signs of wildlife using the area (i.e. deer and fox trails). Figure 8 contains examples of interpretive sign designs.

During the evolution of the wildlife programs, there are several important program values to keep in mind. First, voluntary involvement is crucial and can lead to increased recognition, better community relations and improved environmental performance. Moreover, by implementing proactive habitat enhancement projects at the landfill, IEL Responding Parties will help protect biodiversity. While the projects recommended in this report focus on allowing volunteers to learn and understand wildlife management techniques, the overall goal of the wildlife program should be to increase biodiversity. With this in mind, WHC has recommended several enhancement projects for various areas at the sites including the following.

- Providing nesting structures for bluebirds, tree swallows and American kestrels.
- Planting wildflower meadows.
- Field border management.
- Providing raptor hunter perches and brush piles in open field areas.
- Providing fox dens.
- Providing bat boxes.
- Planting a hummingbird garden.
- Controlling invasive species.

Throughout the formation and growth of the wildlife programs, WHC can provide technical assistance regarding project implementation and maintenance, and recommendations for future projects. WHC staff is also available to participate in meetings, species inventories, planting events and strategic planning of the program. WHC looks forward to assisting the IEL Responding Parties in the development and implementation of long-term habitat management programs and encourages the IEL Responding Parties to continue its leadership in this pursuit.

APPENDIX A

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APPENDIX B

WILDLIFE CITED IN

OPPORTUNITIES REPORT

Appendix B. Wildlife Cited in Opportunities Report

Type	Common Name	Scientific Name
Plants	box elder	<i>Acer negundo</i>
	silver maple	<i>Acer saccharinum</i>
	milkweed	<i>Asclepias syriaca</i>
	field mustard	<i>Brassica rapa</i>
	teasel	<i>Dipsacus sylvestris</i>
	horsetail	<i>Equisetum fistulosum</i>
	green ash	<i>Fraxinus pennsylvanica</i>
	English ivy	<i>Hedera helix</i>
	rush	<i>Juncaceae Family</i>
	Eastern red cedar	<i>Juniperus virginiana</i>
	apple	<i>Malus sylvestris</i>
	Autumn olive	<i>Oleaceae Family</i>
	switch grass	<i>Panicum virgatum</i>
	Phragmites	<i>Phragmites communis</i>
	phlox	<i>Polemoniaceae Family</i>
	big-toothed aspen (poplar)	<i>Populus grandidentata</i>
	black cherry	<i>Prunus serotina</i>
	scrub oak	<i>Quercus ilicifolia</i>
	staghorn sumac	<i>Rhus typhina</i>
	common locust	<i>Robinia pseudoacacia</i>
	raspberry	<i>Rubus occidentalis</i>
	black willow	<i>Salix nigra</i>
	little bluestem	<i>Schizachyrium scoparium</i>
	poison ivy	<i>Toxicodendron pubescens</i>
	red clover	<i>Trifolium pratense</i>
	rock elm	<i>Ulmus thomasi</i>
Birds	red tailed hawk	<i>Buteo jamaicensis</i>
	cardinal	<i>Cardinalis cardinalis</i>
	turkey vulture	<i>Cathartes aura</i>
	chimney swift	<i>Chaetura pelagica</i>
	American crow	<i>Corvus brachyrhynchos</i>
	gray catbird	<i>Dumetella carolinensis</i>
	American kestrel	<i>Falco sparverius</i>
	northern oriole	<i>Icterus galbula</i>
	tree swallow	<i>Iridoprocne bicolor</i>
	eastern bluebird	<i>Sialia sialis</i>
	American robin	<i>Turdus migratorius</i>
Reptile	painted turtle	<i>Chrysemys picta</i>
Mammals	white-tailed deer	<i>Odocoileus virginianus</i>
	muskrat	<i>Ondatra zibethica</i>
	red fox	<i>Vulpes fulva</i>

Amphibian	green frog	<i>Rana clamitans</i>
Insects	bumblebee	<i>Apidae Family</i>
	Spring azure butterfly	<i>Celastrina argiolus</i>
	clouded sulphur butterfly	<i>Colias philodice</i>
	mosquito	<i>Culicidae Family</i>
	field cricket	<i>Gryllidae Family</i>
	European cabbage butterfly	<i>Pieris rapae</i>
Grasses	little bluestem	<i>Andropogon scoparius</i>
	broom sedge	<i>Andropogon virginicus</i>
	side-oats grama	<i>Bouteloua curtipendula</i>
	purple love grass	<i>Eragrostis spectabilis</i>
	June grass	<i>Koeleria cristata</i>
	Indian ricegrass	<i>Oryzopsis hymenoides</i>
	switch grass	<i>Panicum virgatum</i>
	needlegrass	<i>Stipa spartea</i>
Wildflowers	columbine	<i>Aquilegia canadensis</i>
	Verbena stricta	<i>Asclepias syriaca</i>
	butterfly weed	<i>Asclepias tuberosa</i>
	New England aster	<i>Aster novae-angliae</i>
	wild indigo	<i>Baptisia tinctoria</i>
	purple coneflower	<i>Echinacea purpurea</i>
	fireweed	<i>Epilobium angustifolium</i>
	saw-toothed sunflower	<i>Helianthus grosseserratus</i>
	thyme leaved pinweed	<i>Lechea minor</i>
	round-headed bush clover	<i>Lespedeza capitata</i>
	cardinal flower	<i>Lobelia cardinalis</i>
	wild lupine	<i>Lupinus perennis</i>
	wild bergamot	<i>Monarda fistulosa</i>
	horsemint	<i>Monarda punctata</i>
	common evening primrose	<i>Oenothera biennis</i>
	tall cinquefoil	<i>Potentilla arguta</i>
	Canada goldenrod	<i>Solidago canadensis</i>
	hoary vervain	<i>Verbena stricta</i>
Shrubs	Jerseytea	<i>Ceanothus americanus</i>
	common buttonbush	<i>Cephalanthus occidentalis</i>
	silky dogwood	<i>Cornus amomum</i>
	gray dogwood	<i>Cornus racemosa</i>
	American filbert	<i>Corylus americana</i>
	shrubby Saint John's wort	<i>Hypericum prolificum</i>
	common winterberry	<i>Ilex verticillata</i>
	common spicebush	<i>Lindera benzoin</i>

Shrubs	American black currant	<i>Ribes americanum</i>
	Alleghany blackberry	<i>Rubus allegheniensis</i>
	blackcap raspberry	<i>Rubus occidentalis</i>
Trees	boxelder	<i>Acer negundo</i>
	black maple	<i>Acer nigrum</i>
	red maple	<i>Acer rubrum</i>
	common pawpaw	<i>Asimina triloba</i>
	bitternut hickory	<i>Carya cordiformis</i>
	shagbark hickory	<i>Carya ovata</i>
	common hackberry	<i>Celtis occidentalis</i>
	frosted hawthorn	<i>Crataegus pruinosa</i>
	dotted hawthorn	<i>Crataegus punctata</i>
	green ash	<i>Fraxinus pennsylvanica</i>
	common witchhazel	<i>Hamamelis virginiana</i>
	red mulberry	<i>Morus rubra</i>
	American plum	<i>Prunus americana</i>
	black cherry	<i>Prunus serotina</i>
	northern red oak	<i>Quercus borealis</i>
	smooth sumac	<i>Rhus glabra</i>
	staghorn sumac	<i>Rhus typhina</i>
Vines	common trumpetcreeper	<i>Campis radicans</i>
	American bittersweet	<i>Celastrus scandens</i>
	virginsbower	<i>Clematis virginiana</i>
	common moonseed	<i>Menispermum canadense</i>
	Virginia creeperq	<i>Parthenocissus quinquefolia</i>
	common greenbrier	<i>Smilax rotundifolia</i>

APPENDIX C

INFORMATION SOURCES

Appendix C. Information Sources

Conservation Organizations

Bat Conservation International

P.O. Box 162603
Austin, TX 78716
512-327-9721
www.batcom.org

Boy Scouts of America

Mike Jones

Location Address:

1601 South Main Street
Akron, OH 44301

Mailing Address:

P.O. Box 68
Akron, OH 44309
330-315-5053

The Dawes Arboretum: Promotes the planting of forests and ornamental trees.

7770 Jacksontown Rd., SE
Newark, OH 43056
740-323-2355
1-800-44-DAWES
www.dawesarb.org

Environmental Education Council of Ohio

P.O. Box 2911
Akron, OH 44309
614-695-5100

The Holden Arboretum: Promote the knowledge and appreciation of plants for personal enjoyment, inspiration, and recreation.

9500 Sperry Rd.
Kirtland, OH 44094
440-256-1110
440-256-1655 fax
holden@holdenrb.org

League of Ohio Sportsmen: Devoted to the wise use, conservation, aesthetic appreciation, and restoration of wildlife and other natural resources.

3953 Indianola Ave.
Columbus, OH 43214
614-268-9924

NRCS Wildlife Habitat Incentives Program (WHIP)

Patrick K. Wolf, State Conservationist

Rm. 522

200 N. High St.

Columbus, OH 43215

614-469-6962

National Audubon Society

692 N. High St.

Suite 208

Columbus, OH 43215

614-224-3303

614-224-3305 fax

North American Amphibian Monitoring

Dr. Harry Schutte

Department of Biological Science

Room 067, Irvine

Ohio Univeristy

Athens, OH 45701

740-593-9486

schutte@ohiou.edu

North American Association for Environmental Education

P.O. Box 400

Troy, OH 45373

513-676-2514

The North American Bluebird Society

P.O. Box 74

Darlington, WI 53530

www.nabluebirdsociety.org

The Ohio Academy of Science: Stimulates interest in the sciences, to promote research, to improve instruction in the sciences, and to recognize high achievement in attaining these objectives.

1500 W. 3rd Ave.

Suite 223

Columbus, OH 43212

614-488-2228

oas@iwaynet.net

Ohio Alliance for the Environment: Provides leadership in resolving environmental conflicts and to promote and support environmental education in Ohio.

445 King Ave.

Columbus, OH 43201

614-421-7819

614-421-7819 fax

www.shell.idt.net/~oaenvi19/oea.htm

Ohio Bluebird Society

20680 Twp. Rd 120

Senecaville, OH 43780

www.obsbluebirds.com

iathomatu@wesnet.com

Ohio Department of Agriculture

8995 E. Main St

Reynoldsburg, OH 43068

614-466-2732

Ohio Department of Natural Resources

Fountain Square

Columbus, OH 43224

614-265-6565

Ohio Division of Wildlife

Kendra Wecker, Administrative Assistant

1840 Belcher Drive

Columbus, OH 43224

614-265-7043

614-262-1143 fax

kendra.wecker@dnr.ohio.gov

Ohio Environmental Council, INC.: Promotes improved environmental, advocacy, research, education and collaborative efforts.

Suite 201

1207 Grandview Ave.

Columbus, OH 43212

614-487-7506

Ohio Environmental Protection Agency

1800 Watermark Dr.

P.O. Box 163669

Columbus, OH 43216

Partners for Wildlife
Kent Kroonemeyer/Bill Hegge
6950-H Americana Parkway
Reynoldsburg, OH 43068
614-469-6923

Seed Sources:

C.M. Brown Nurseries, INC.
4906 Middle Ridge Rd
Perry, OH 44081
440-259-5403
440-259-4965 fax
info@cmbrown.com

Dayton Nursery
3459 Cleveland Massillon
Norton, OH 44203
330-825-3320

Girard Nurseries
P.O. Box 428
6839 N. Ridge East
Geneva, OH 44041
440-466-2881
440-466-3999 fax

Hoot Owl Nursery
Location Address:
4308 Rhoric Road
New Marshfield, OH 45766
Mailing Address:
P.O. Box 91
New Marshfield, OH 45766

Marietta State Nursery
Roger Hendershot
Box 428
Reno, OH 45773
740-373-6574

Sunny Border Ohio Nurseries Inc
3637 State Route 167
Jefferson, OH 44047
800-577-1760
440-858-9666 fax

Zanesville State Nursery
Chuck Bathrick
5880 Memory Rd
Zanesville, OH 43701
740-453-9472

APPENDIX D

WHC MEMBERS' "GOOD IDEAS"

**(For reference only. Please refer to the
black bound copy of this report for full
Appendices)**

APPENDIX E

CERTIFICATION INFORMATION

**(For reference only. Please refer to the
black bound copy of this report for full
Appendices)**

APPENDIX F

HABITAT MANAGEMENT SERIES

**(For reference only. Please refer to the
black bound copy of this report for full
Appendices**

**I. ADDENDUM TO OPPORTUNITIES REPORT FOR INDUSTRIAL
EXCESS LANDFILL**

The Industrial Excess Landfill PRPs are collaborating with the Wildlife Habitat Council (WHC) to pursue a voluntary wildlife habitat enhancement program at the Industrial Excess Landfill (IEL) in Uniontown, OH. The purpose of this addendum is to briefly demonstrate the complimentary relationship between the habitat and community projects, as described in the Opportunities Report, and the proposed biodiverse phytoremediation cap. Detailed recommendations on projects and their implementation are provided in the report.

After the site visit conducted by Marcia Maslonek, the PRPs expressed interest in the implementation of a modified phytoremediation cap that would preserve and enhance as much habitat as feasible. A joint visit between WHC and Applied Natural Sciences was then conducted to discuss this possibility. Both parties agreed that supplementing the existing cottonwoods with hybrid poplars in specific areas only where needed, as determined by Applied Natural Sciences, would be preferred to the traditional phyto cap. This approach would preserve the water-consuming properties of the mature cottonwoods and other species already present on the landfill, in addition to promoting overall biodiversity. Habitat enhancement projects, as mentioned below and in the Report, would then be implemented in areas adjacent to and outside of the poplars. Retention and supplementation of the existing vegetation on the landfill, where feasible, is also a potential habitat project. For instance, the existing silky dogwood shrubs are providing berries for a variety of wildlife species, in addition to cover.

II. Impact of Recommendations on Proposed Biodiverse Phytoremediation Cap:

A. Nest Box Program

Creating a nest monitoring program for bluebirds, tree swallows, and American kestrels throughout the property can be done on any area of the landfill cap as well as the buffer. These species, however, prefer open grassy areas which may be eliminated with the poplar cap. Open field habitat can be retained in areas such as cell 22-25, 15, 20, and other areas where poplars are not be required (see attached map). Nest boxes and management for these species can also occur in cells 1,6,11,and 16 for similar reasons. Rotational mowing to maintain this state will be needed, and is described in detail in the report. In wooded sections of the landfill nest boxes can be erected for other species of songbirds and raptors, such as the eastern screech owl. A nest box program is an excellent project for the involvement of community, schools, and local conservation groups.

B. Wildflower Meadow and Hummingbird Garden

Nectar sources can be provided for pollinators such as hummingbirds, butterflies, and bees by constructing a wildflower meadow and hummingbird garden. Both of these projects were suggested for areas not affected by the proposed phyto cap. The meadow can be implemented in any location that the PRPs wish, but the open field upon entering the gates (cell 1) is an excellent location. The hummingbird garden was suggested for outside the gates on either side of the entrance road. Both locations would be visible to the public and provide a pleasing view, as well as benefit to wildlife.

C. Field Border Management Program

Field border management includes a rotational mowing program, enhancing the hedgerow, and planting forested islands that will provide more diversified habitat types on the landfill. This complements the biodiverse phyto cap by

supplementing the poplars with other species of trees and shrubs to increase diversity, food sources, and shelter for a variety of wildlife, from songbirds to game species. Maintaining the existing hedgerow along the fenceline will also leave hardwood species intact as well as food sources found in the bushes and shrubs. The hedgerow as it stands is a valuable edge habitat. Rotational mowing will maintain open field areas which are important to other species, such as the bluebirds and kestrels. This practice will also encourage ground-nesting birds as well as an abundance of prey for various predators. This can be done in the wildflower meadow(s), open fields, and around tree/shrub islands.

D. Raptor Management

Raptors (bird-of-prey) can be managed for on site by promoting a balanced predator-prey relationship. Besides management of open fields and the hedgerow, building brush piles and placing raptor perch posts around the landfills will encourage their use of IEL. The raptor perch should be placed in an open area, such as any of the cells mentioned for the open field habitat. This provides a good vantage point for spotting prey. Brush piles can be constructed near the tree islands, in open fields, or near the hedgerow. They can be placed within the poplars as well.

E. Fox Management

Red foxes have been seen on site, and many of the projects mentioned in the report will enhance the food and cover for this species (i.e. brush piles, rotational mowing, etc.) However, providing an artificial fox den to encourage foxes on the landfill is another project that can be implemented relatively easily. The den should be constructed in any open area near cover, but where little disturbance will occur. The den is a highly-visible and simple project which can stir enthusiasm with the community and students on site.

F. Bat Boxes

Bat boxes can be installed near Metzger's Ditch to control mosquito populations. Although it may take several years before bats will locate and occupy the box, once established, a single bat can eat over 600 insects in an hour. The open area near the lagoon is an excellent location. A bat box is also a strong educational tool to educate the public on this misunderstood mammal.

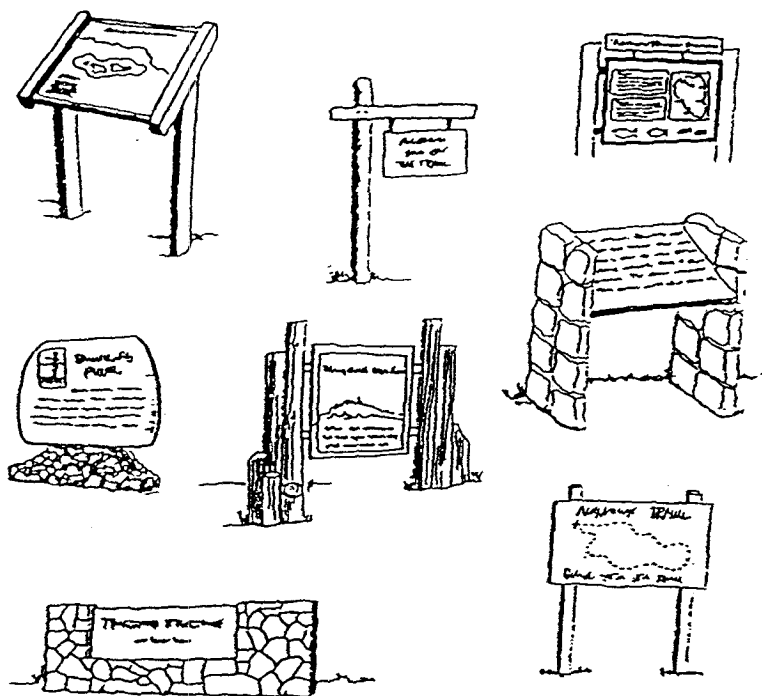
G. Control invasive species

There are several invasive species present at IEL that, if not controlled, could compete with and overtake native and/or more desirable vegetation. The common reed (*Phragmites*), autumn olive, and sumac are examples. Control methods are explained in detail in the report. At this stage, they can be easily controlled, but if left to spread much further, they will be difficult to keep in check. Control of invasive plant species will not only benefit wildlife, but also the phytocap itself.

Conclusion

WHC looks forward to assisting the IEL PRPs in their effort to provide habitat for wildlife at the IEL. The biodiverse phyto cap has the potential to serve as a unique demonstration site for the Superfund program. Greenspace, a disappearing asset in many communities, would be conserved, and a community resource created from a once controversial and unusable site. WHC plans to be involved in the implementation of the habitat projects, and looks forward to the opportunity to bring together community, local organizations, and industry for the benefit of wildlife and education.

Figure 9. Interpretive Signs



Source: Ham, Sam H. 1972. *Environmental Interpretation: A Practical Guide for People with Big Ideas and Small Budgets*. North American Press, Golden, Colorado. 400pp.

Certain areas such as the lagoon and wildflower meadow along the trail will naturally lend itself to interpretive signs. Specifically, a variety of information could be made available to visitors about the value of wetlands and native plant species to wildlife. A predator-prey station would also be ideal due to the brush piles, raptor perches, and fox den. Animal track molds are simple to include on interpretive signs, as well. If tracks are found on the site, such as those of the fox, pour melted paraffin poured into the track and allowed to cool will provide a 3-dimensional track for an educational station. If no tracks are found on site they could be cut out of wood, covered with a preservative, and glued to an interpretive sign that includes information on the animal. Furthermore, signs providing information on native plant species are recommended. This can include written information, a drawing or 3-dimensional wood outline of a leaf, and a seed glued to the sign. WHC recommends that interpretive signs stress the importance of biodiversity and how these projects contribute to improving biodiversity. Interpretive

stations will provide the community with additional opportunity to inform them on how to be good land stewards within their community.

2. Trail Maintenance

The nature trail will need attention and maintenance to keep it accessible and useful. Signs and information stations may need to be maintained so that the information provided will continue to be available and updated for everyone using the trail. Other maintenance activities include resurfacing the trail, repairing steps or walkways, removing fallen trees, or picking up brush and trash to keep the trail in good shape.

B. Education Center

WHC recommends, as a future, potential project, that an education center be built by the front gate. The education center will serve as a community meeting place where education seminars and routine meetings about IEL could be held. The education center should be interactive and provide specific information about the programs and projects that are or will be implemented at the site. The education center will be especially important if access to the site is going to be restricted. The center will show the community that IEL Responding Parties are serious and devoted to becoming good community members.

VI. FUTURE PROJECTS

As the program builds and interest grows, additional projects should be pursued to maintain momentum and continue expanding the program. With the growth of the program will come additional opportunities to contribute to pressing environmental and wildlife conservation goals. WHC encourages IEL to give these initiatives consideration as they arise. In addition to unforeseen opportunities for employees to contribute

positively to wildlife conservation, WHC recommends exploring additional areas of the site for future projects.

A. Develop Formal Educational Programs

There are a number of local schools that could utilize the IEL as an outdoor classroom. WHC recommends that the IEL Responding Parties start a Corporate Lands for Learning Program (CLL).

The Corporate Lands for Learning (CLL) program is a partnership between WHC, an individual facility, and an organization, individual school or school system, which establishes an environmental education program at the facility. The program promotes an awareness of the role of corporations in protecting the environment, teaching the public about nature in an outdoor (and/or indoor) classroom. CLL provides a vehicle for on-going study of local wildlife habitat and an awareness of how everyday actions can affect the quality of this habitat.

Considerations for establishing a CLL program include: determining the appropriate partners, determining what is needed to make the site an effective outdoor classroom, training teachers to use the site and developing an educational advisory committee to guide the CLL program into the future. By participating in this program, the IEL Responding Parties will gain recognition as a corporate leader in environmental education and encourage employees to think critically and solve problems.

B. Lagoon Enhancements

The lagoon provides a valuable wetland area. As a future project, IEL could consider providing additional basking structures for painted turtles, planting native wetland vegetation along banks, and possibly expanding another area along the ditch to create a second lagoon for maximum wildlife benefit. Special attention should be paid to this area during inventories, including nocturnal ones for amphibians. Results could be

shared with the North American Amphibian Monitoring Program (see Appendix for contact information).

VII. WHC CORPORATE HABITAT CERTIFICATION/INTERNATIONAL ACCREDITATION PROGRAM

WHC certification provides recognition of the efforts put forth by sites that demonstrate a long-term commitment to managing habitat for wildlife. As a reward for a company's efforts, descriptions of certified programs are published in an annual registry and press releases approved by the site are distributed to local and national news contacts. Sites with WHC-certified programs also receive an award plaque and are honored at WHC's annual symposium.

IEL could be eligible to apply for certification in 2001 if at least one project is implemented prior to July 2000. Habitat enhancement projects need to be implemented, documented, monitored and maintained for at least one year. The wildlife team members will need to submit the necessary documentation for their program to be considered for certification. Employee and community participation in the program is also reviewed and greatly strengthens the application. Overall, IEL must demonstrate a commitment to good environmental stewardship. WHC can assist in compiling material that could be submitted for certification. A team of wildlife biologists will review the documentation to determine if the program meets the criteria of certification.

As outlined on the certification application form included in Appendix E of this report, the following items should be included in the application.

- An inventory of the animal and plant species found on each site.
- Wildlife management plans.
- Activities logs, showing when meetings were held, when projects were implemented, and what management techniques were used.

- Documentation of maintenance and monitoring activities to demonstrate that the programs are ongoing. (Documentation should include before and after photographs, number and species of any plants used, success of nest boxes, dates of projects and records of those involved.)

In order to continue to recognize sites for their wildlife programs and to ensure that their commitment to creating wildlife habitat is long-term, WHC requires certified sites to apply for recertification two years after their initial certification and every two or three years thereafter. The recertification process also allows WHC to review the site's efforts, provide recommendations for continued habitat enhancement and recognize new projects. Further information about the certification process and associated awards such as Rookie of the Year can be found in Appendix E of this report.

VIII. SUGGESTED IMPLEMENTATION SCHEDULE

WHC does not suggest that projects in this report be implemented all at once. WHC has simply provided a menu of options from which IEL can choose the projects of most interest. The goal is to create an exceptional program that can be incorporated into everyday activities. The following implementation schedule is suggested as a basis for the IEL program, and to help volunteers assign a relative priority to the listed projects. IEL can use it as a template for their program and add or subtract ideas as they choose.

Phase I

Program Development

- Create volunteer wildlife teams
- Begin drafting the wildlife management plans
- Initiate the wildlife inventories
- Begin project-monitoring efforts

Project Implementation

- Install nesting structures

Plant hummingbird garden

Build fox dens

Phase II

Program Development

Continue the wildlife inventory

Meet community leaders that could benefit from project

Continue project-monitoring efforts

Start developing the nature trail

Project Implementation

Plant wildflower meadow

Install bat boxes

Begin controlling invasive species

Phase III

Program Development

Continue the wildlife inventory

Continue project-monitoring efforts

Apply for certification

Develop CLL program

Project Implementation

Manage for balanced predator-prey populations

Implement field border management

IX. SUMMARY

IEL Responding Parties presents the Uniontown community with a variety of opportunities for enhancing wildlife habitat and improving environmental awareness at the IEL. WHC has developed the recommendations in this report to best supplement existing habitat types and to correspond to goals of the IEL Responding Parties' habitat enhancement, community involvement and public recognition of its environmental commitment.

APPLIED NATURAL SCIENCES, INC.
Agronomic Investigation
Industrial Excess Landfill
at
Uniontown, OH

submitted by
Applied Natural Sciences, Inc.
4129 Tonya Trail
Hamilton, Ohio 45011

Ph: 513-895-6061

Fax: 513-895-6062

email: ans@fuse.net

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A.	SOIL SAMPLING	1
B.	TISSUE SAMPLING	1
C.	PHOTOGRAPHIC SURVEY	2
D.	SITE CONDITIONS	2
1.	<i>Soil and Topographic Conditions</i>	2
2.	<i>Soil Chemical Conditions</i>	2
a)	Primary Nutrients - N, P & K	2
b)	Secondary & MicroNutrients - S, Ca, Mg, Zn, Cu, Fe, Mn	3
c)	Other Parameters - pH, SS, OM, Na, CEC	3
3.	<i>Vegetation</i>	3
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III.	RECOMMENDATIONS	4
Tables Figures & Photographs		Appendix I

Agronomic Investigation

- Industrial Excess Landfill at Uniontown, OH -

I. INTRODUCTION

In August, 2000 Applied Natural Sciences, Inc. (ANS) conducted a site investigation designed to evaluate site conditions relative to the implementation of a vegetative cover (phyto cap) for the Industrial Excess Landfill (IEL) at Uniontown, OH. This investigation focused on the condition of the vegetation and soil cover across the site. To accomplish these tasks, the site was surveyed and staked to a 200 feet by 200 feet grid. A total of 25 grid squares were created and each grid was given a numerical designation in addition to the alpha-numeric coordinates designations (see Figure 1). Soil samples were collected from each grid. A ground photographic survey of the site was also completed to provide documentation of the vegetative survey that was performed by the Wildlife Habitat Council.

A. Soil Sampling

Each of the 25 grid squares was physically transected across the middle of the grid in a direction that was roughly perpendicular to its slope. Shallow (0-6 inch) soil samples were collected at four equidistant locations along the transect. These within-grid soil samples were composited and subsampled. The bagged subsamples were labeled and placed in an iced cooler for overnight shipment to Servi-Tech Laboratory, an agricultural testing laboratory in Dodge City, Kansas.

B. Tissue Sampling

Two tissue samples were collected from the eastern boundary of Grid 7. Leaves were collected from 1 to 2 inch and 2 to 4 inch diameter trees and submitted to Servi-Tech Laboratories for nutrient analysis.

C. Photographic Survey

Photographic evidence of the site's vegetative diversity was obtained at grid coordinates along the eastern and western portions of the site. Typically 360° scans were obtained near coordinates B through E along rows 02+00 and 06+00 (see Figure 2 & Photographs in Appendix I). Additional scans were taken from near coordinates B, 04+00 and E, 08+00. These scans were able to provide a representative photographic capture of most of the site.

D. Site Conditions

1. Soil and Topographic Conditions

The site encompasses roughly 30 acres. About half of the landfill cover is situated on a slightly sloping plateau on the western portion of the site. Near the middle of the landfill area, the slope becomes steep to the east and continues this progression to the eastern boundary of the site (Figure 3). On the plateau, the relief has a slightly undulating quality that is probably a reflection of the settling of the landfill material below. Poplar trees appear to be successfully populating these areas. Sparely vegetated areas are scattered across the site and are located primarily on the steeper slopes.

The soil cover is estimated to be two feet thick. However, the cover was approximately 6 inches thick in at least one of the sparsely vegetated areas. The soil texture is gravely and ranges from a loamy sand to a sandy loam (see Table 1). The moisture holding capacity on 2 feet of this cover soil would be at most an acre-inch of water or enough for about 3 days of high transpiration by the vegetation.

2. Soil Chemical Conditions

a) Primary Nutrients - N, P & K

Nitrogen, phosphorus and potassium are considered the primary plant nutrients. These nutrient levels, while variable, are generally low to very low with the best soils being at the base of the eastern slope. Nitrogen levels were very low, potassium levels were low and except for the soils at the base of the slope, Phorsporus levels were low to very low.

b) Secondary & MicroNutrients - S, Ca, Mg, Zn, Cu, Fe, Mn

Sulfur, calcium and magnesium are considered secondary nutrients as lesser amounts are needed in the plant for healthy growth while, correspondingly, the remainder are termed micronutrients due to very low concentrations required. Calcium and magnesium levels are generally good while the micronutrients such as iron (Fe) and copper (Cu) were low. The remaining parameters are generally in concentrations adequate for healthy plant growth with the exception of higher than normal concentrations of metals such as zinc (Zn) and manganese (Mn) which hasn't adversely affected the site's vegetation growth and development.

c) Other Parameters - pH, SS, OM, Na, CEC

Soluble salt (SS) and sodium (Na) levels are generally low and do not pose a vegetative hazard. Organic matter (OM) levels are generally good and reflect the contributions by the rhizosphere in the 0 to 6 inch sampling interval. Cation exchange capacity (CEC - the cation attenuation capacity of the soil material) values are consistent with the type of material encountered and the organic matter content of the samples.

3. Vegetation

The site's ecosystems are identified and presented in Figure 4. Poplar trees are the predominant woody species on the site with locust trees being the second most dominant species. Willow trees are well established in the wetland and are becoming established in sections of the grassland and on the perimeter of the central woodlot. Elm, chinese elm, and apple trees are scattered across the site. The forest edges, western grassland and woodlots are on boundary property off of the landfill.

II. CONCLUSIONS OF AGRONOMIC INVESTIGATION

The objective of this agronomic investigation was to evaluate current conditions and develop recommendations regarding the feasibility of creating a vegetative cover on the landfill commonly referred to as a Phyto Cap. It is clear that the existing woody vegetation is well rooted into the landfill waste. The state of growth of the trees that was observed at the site could not be supported by the soil cover qualified in this report. The

soil nutrient status is too low and the moisture holding capacity is too limited to support the productive growth that was observed. The tissue sample data (see Table 1) further support this conclusion. The data indicated adequate nutrient status in spite of the very low soil nutrient supply.

Groundwater data supports the notion that natural attenuation is aggressively controlling contaminant evolution from the landfill. Tree root systems enhance natural attenuation by providing nutrients, oxygen, substrates and a mechanism for transporting and supporting diverse microbial populations well into the landfill waste. Therefore, based on the site's environmental conditions and the current productive state of the existing vegetative cover it is apparent that the only activities that would be reasonable would be the repair and enhancement of existing conditions.

III. Recommendations

In consideration with the Wildlife Habitat Council and the local authorities, the tree population on the plateau area (see Figure 5) of the site should be supplemented with poplar and locust trees to achieve a tree population density spacing between 12 to 15 feet. The steeper slope of the landfill cover should essentially remain a grassland with enhancements for wildlife. The western boundary that is off of the landfill would be used for establishing hardwood trees for nut production and shrubs for berries to enhance wildlife food supplies (Figure 6).

APPENDIX I

- Tables, Figures & Photographs -

Table 1. Agronomic Data from Soil & Tissue Sampling

Soil Fertility Parameters																			
Lab #	Location	Sample ID	Depth inches	pH	S.S. meq/100cc	O.M. %	NO3-N mg/kg	P mg/kg	K mg/kg	Zn mg/kg	Fe mg/kg	Mn mg/kg	Cu mg/kg	S mg/kg	Ca mg/kg	Mg mg/kg	Na mg/kg	CEC	%H
%K	%Ca	%Mg	%Na																
Lab #	Location	Sample ID	Depth inches	pH	S.S. meq/100cc	O.M. %	NO3-N mg/kg	P mg/kg	K mg/kg	Zn mg/kg	Fe mg/kg	Mn mg/kg	Cu mg/kg	S mg/kg	Ca mg/kg	Mg mg/kg	Na mg/kg	CEC	%H
%K	%Ca	%Mg	%Na																
53310	IEL	1	0-6	7.5	0.11	1.6	2.6	18	54	2.9	45.9	16.0	1.2	7	1044	76	9	6	0
53311	IEL	2	0-6	7.8	0.15	2.3	2.3	9	63	1.8	26.3	13.8	1.7	6	1416	95	6	8	0
53312	IEL	3	0-6	7.8	0.14	2.0	2.1	6	54	1.2	54.0	14.6	0.7	7	1486	95	6	8	0
53313	IEL	4	0-6	7.8	0.17	2.5	2.1	6	76	1.7	20.9	21.5	1.0	7	1352	87	5	8	0
53314	IEL	5	0-6	7.6	0.16	3.2	2.7	10	74	1.7	19.5	20.3	1.3	9	1599	121	6	9	0
53315	IEL	6	0-6	7.8	0.13	1.9	2.4	3	49	3.0	23.9	12.2	2.0	9	1403	80	8	8	0
53316	IEL	7	0-6	7.7	0.15	1.6	2.1	4	54	1.1	15.5	15.0	0.9	10	1619	113	6	9	0
53317	IEL	8	0-6	7.6	0.15	1.6	3.2	4	64	2.5	29.7	17.0	1.8	10	1686	95	7	9	0
53318	IEL	9	0-6	7.8	0.12	1.3	2.2	9	64	2.0	15.6	17.3	0.7	8	1638	112	6	9	0
53319	IEL	10	0-6	7.6	0.18	3.4	2.9	13	77	2.3	19.8	19.5	1.2	8	1556	135	7	9	0
53320	IEL	11	0-6	7.7	0.17	2.6	2.6	6	63	4.3	31.7	19.0	2.8	10	1677	125	7	10	0
53321	IEL	12	0-6	7.7	0.15	2.4	2.1	3	76	2.4	22.6	16.4	1.4	7	1535	129	8	9	0
53322	IEL	13	0-6	7.5	0.20	3.2	2.7	5	64	2.2	22.6	18.1	1.1	7	1414	129	7	8	0
53323	IEL	14	0-6	7.4	0.19	3.0	3.5	6	59	2.1	27.5	22.3	1.8	7	1241	106	5	7	0
53324	IEL	15	0-6	7.6	0.21	3.4	4.8	26	96	2.1	20.9	20.7	0.9	7	1623	135	5	10	0
53325	IEL	16	0-6	7.8	0.15	2.2	2.1	4	50	1.7	22.0	16.0	3.5	7	1419	94	6	8	0
53326	IEL	17	0-6	7.9	0.13	1.6	2.6	9	52	1.2	15.2	12.4	1.0	9	1783	98	6	10	0
53327	IEL	18	0-6	7.8	0.15	2.1	2.7	4	55	1.4	15.9	14.9	0.8	14	1506	97	6	9	0
53328	IEL	19	0-6	7.8	0.14	2.7	3.2	28	52	1.9	16.4	16.2	0.7	8	1334	82	6	8	0
53329	IEL	20	0-6	7.7	0.17	2.2	3.7	10	74	1.4	20.4	12.9	1.1	9	1380	121	6	8	0
53330	IEL	21	0-6	7.9	0.15	1.8	2.8	5	56	1.5	17.6	16.1	1.2	8	1660	99	7	9	0
53331	IEL	22	0-6	7.8	0.15	3.5	5.9	7	70	2.9	17.5	22.5	0.9	8	1424	92	5	8	0
53332	IEL	23	0-6	7.9	0.13	3.0	4.8	13	46	1.5	18.0	20.5	1.3	8	1577	69	5	9	0
53333	IEL	24	0-6	7.6	0.18	3.5	3.8	10	78	1.9	25.4	22.1	1.1	8	1671	115	6	10	0
53334	IEL	25	0-6	7.6	0.18	4.0	3.2	15	73	2.6	20.3	27.2	0.8	9	1519	98	4	9	0
53335	IEL	Bad Shallow (24x)	0-3	7.6	0.19	2.3	5.3	11	40	1.6	48.4	13.8	3.0	11	1030	34	5	6	0
55220	IEL	Bad Deep (14x)	3-4	7.4	0.24	1.9	2.9	19	55	4.3	126.4	10.2	2.8	12	928	69	8	5	0
Medium Soil Test Value Range								15-22	101-150	0.6-1.0	2.1-4.5	1.1-2.0	0.5-0.7			51-100			
Soil Texture																			
Sample ID:			Soil Texture:																
1			Sandy	Loam															
4			Loamy	Sand															
7			Loamy	Sand															
10			Sandy	Loam															
13			Sandy	Loam															
16			Loamy	Sand															
19			Loamy	Sand															
22			Loamy	Sand															
25			Loamy	Sand															
24X			Loamy	Sand															
Tissue Samples																			
Lab No.	Location	Tree Diameter	Sampled	Analyzed	Tissue	N %	P %	K %	Ca %	Mg %	S %	Na mg/kg	Zn mg/kg	Fe mg/kg	Mn mg/kg	Cu mg/kg	B mg/kg		
2871	IEL	1"-2"	8/29	9/1/00	LEAVES	1.34	0.12	1.57	2.46	0.35	0.54	181	158	72	7	65	0.02		
2872	IEL	2"-4"	8/29	9/1/00	LEAVES	1.42	0.14	1.14	2.7	0.34	0.39	195	238	73	8	88	0.01		

Figure 1 - Survey Coordinates & Grid Numbers



[illegible]

Figure 3 - Site Topography

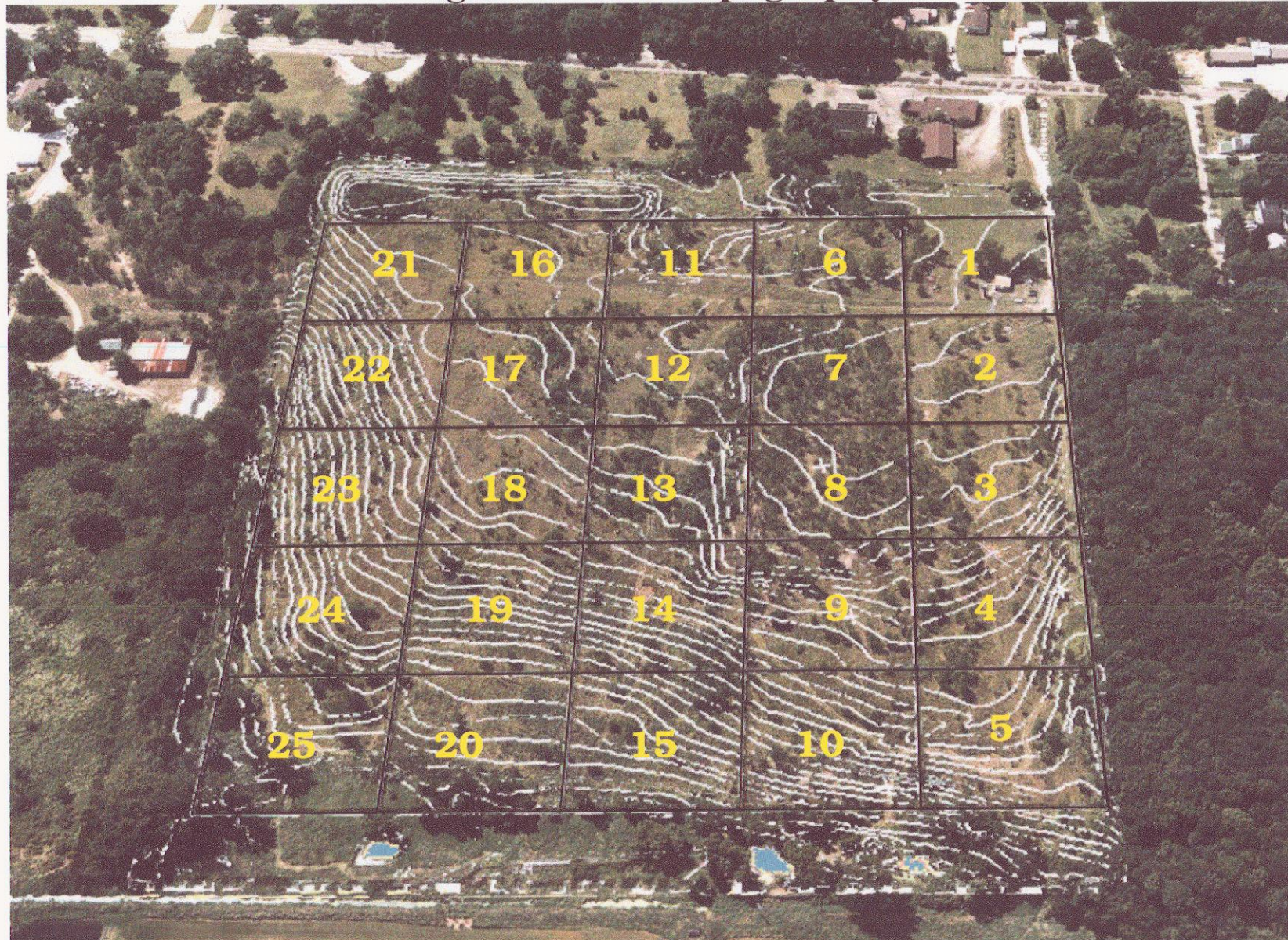


Figure 4 - Current Ecosystem

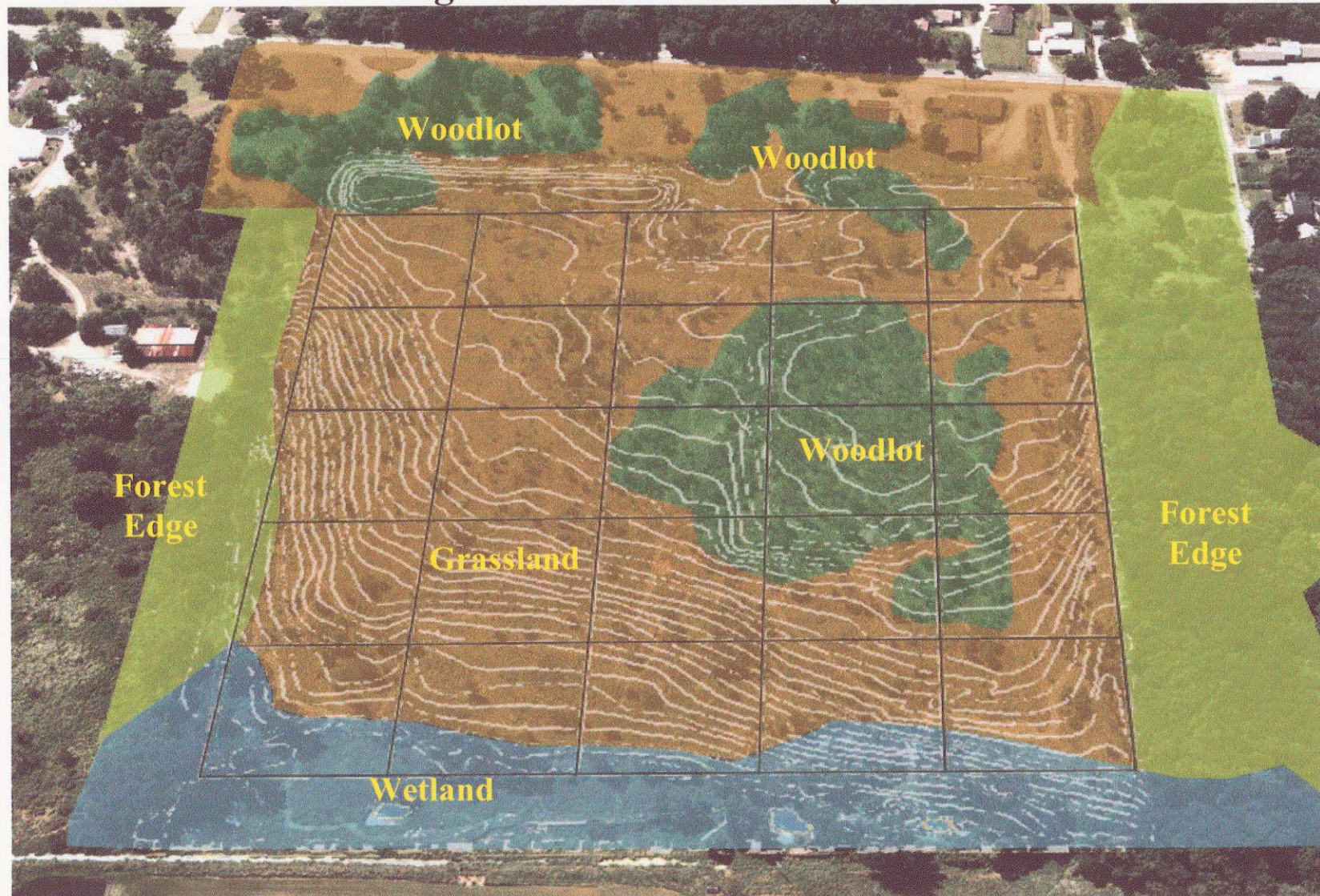
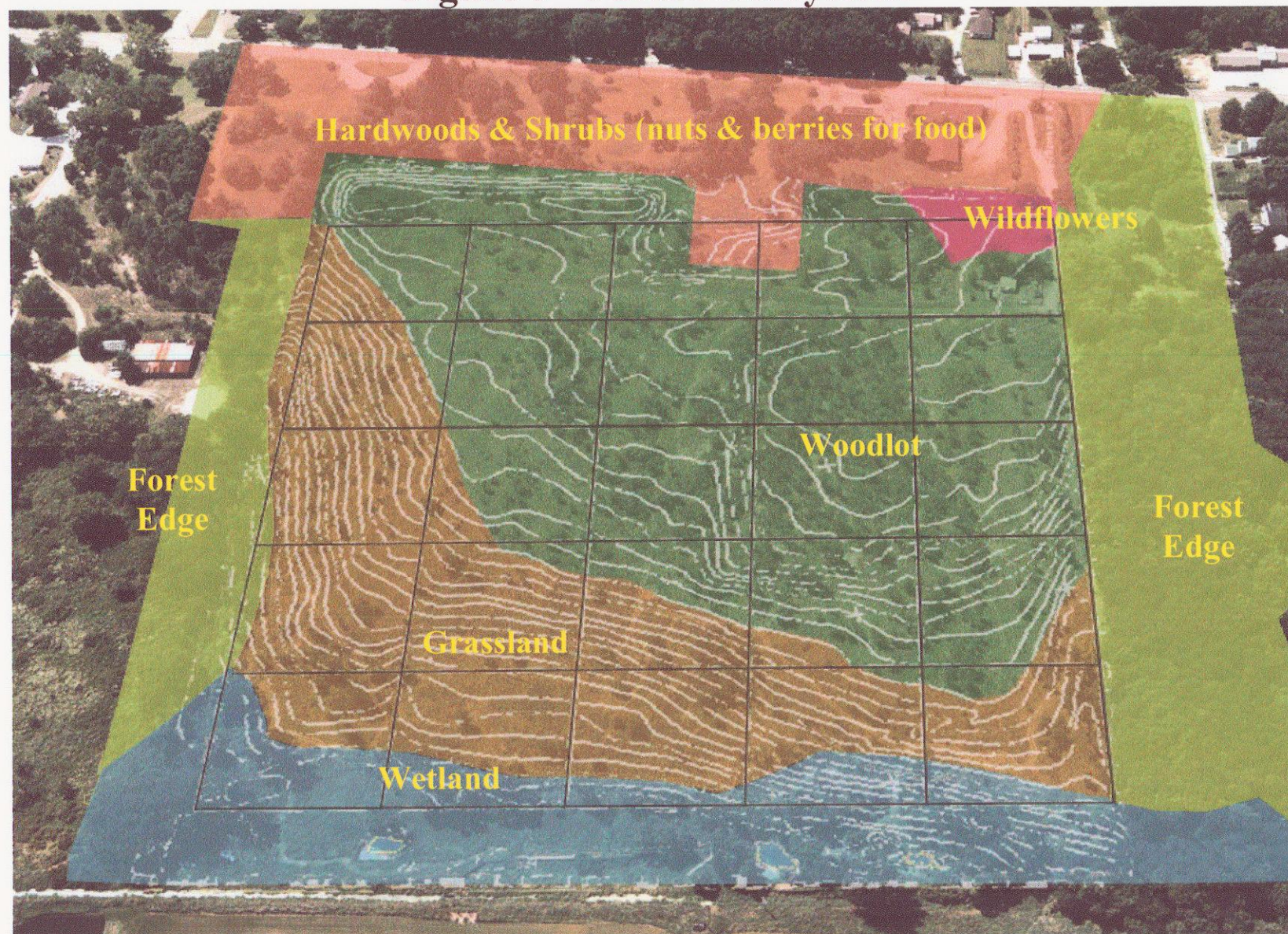


Figure 5 - Tree Planting Area



Figure 6 - Future Ecosystem

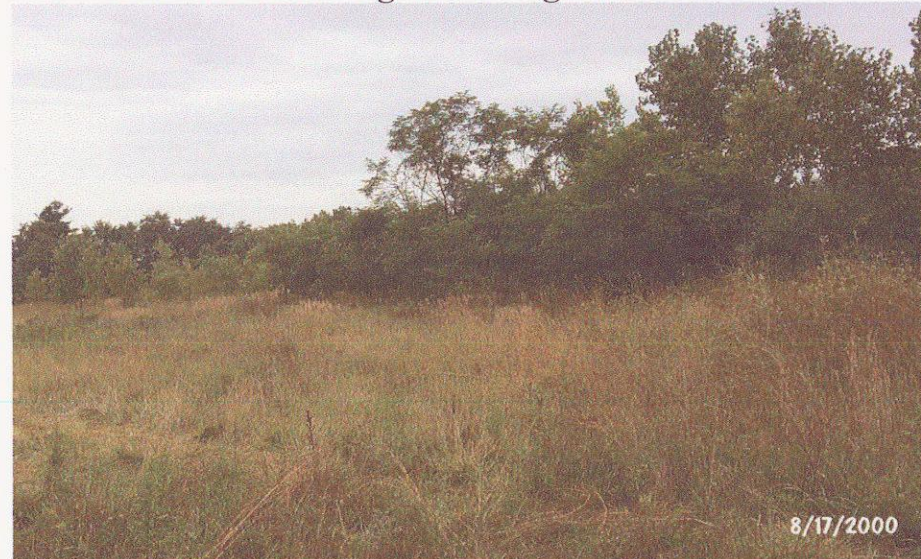


Photographs

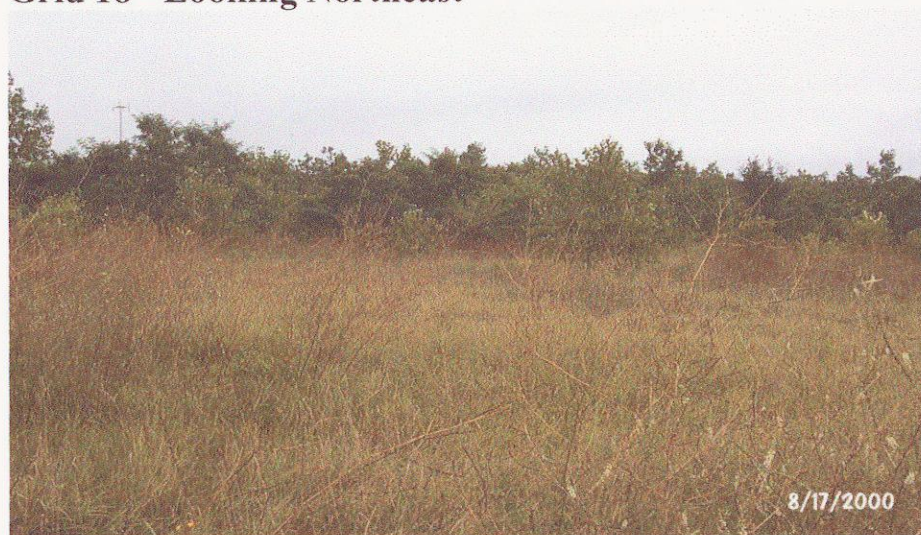
Grid 1 - Looking West



Grid 11 - Looking south to grids 16 & 21



Grid 18 - Looking Northeast



Grid 8 - Looking South West

